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THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

EDITED BY

THEO. S. CASE.

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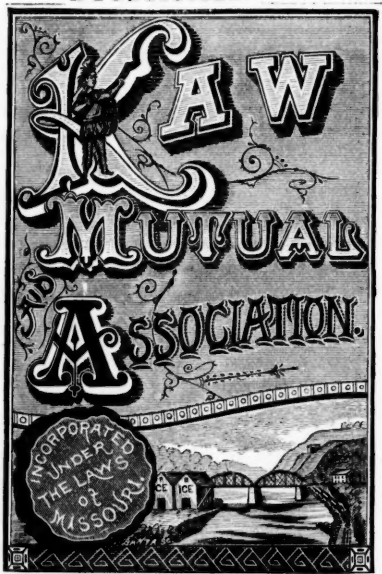

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SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VII. JULY, 1883. NO. 3.

PROCEEDINGS OF SOCIETIES.

THE PROGRESS OF SCIENCE IN THE PAST YEAR.

HON. R. T. VAN HORN.

(*Read at the 8th Annual Meeting of the Kansas City Academy of Science, May 29, 1883.*)

The task undertaken this evening was imposed by your action during my absence, and is one usually requiring wide examination and reference to many authorities. It is fortunate for you and me both, that the original discoveries in science the past year are few, the activity in that department being mainly in the investigation of principles and in improved methods of application of previous knowledge. And it is natural, perhaps, in this utilitarian age, that discovery and improved processes are largely in the direction of the useful and industrial arts.

We may begin with constructive engineering. The most notable event is the completion of the bridge over the east river between New York and Brooklyn, which was formally opened with ceremonies of a character suited to its importance on Thursday last. Its complementary work, the tunnel under the Hudson River, is progressing satisfactorily.

Last year a commission was appointed by the Secretary of the Treasury, to investigate and report upon the theory of Mr. D. T. Lawson, of Ohio, in reference to the explosion of steam boilers. His theory is that boilers explode from the sudden abstraction of steam, which relieving the water in the boiler from pressure, causes it to instantly burst into steam. This sudden change of the superheated water into steam exerts an effect by concussion on all parts of the

iron surface very much greater than the ordinary or normal pressure, often to the extent of explosion.

The experiments by the commission have tended in all respects to sustain this theory, as boilers were exploded at pressures far below what they had previously withstood without injury, by providing means by which the steam was suddenly removed from the steam-space in the boiler. Some difference existed in the commission as to whether the trials did not exaggerate the conditions beyond what would be in the practical use of boilers, but the weight of opinion was contrary and the report of all the members was decidedly in favor of the correctness of Mr. Lawson's theory, and there seems to be no doubt of its great value in boiler construction for the future. The remedy he suggests, is an arched diaphragm fixed horizontally in the boiler near the water line and supplied with valves under the control of the engineer; the object being to retard the time of passage of steam from the water-compartment, thus preventing the instantaneous removal of the pressure from the water. This idea also received the approval of the commission.

Considerable attention has been bestowed in the large cities of the country upon what has been considered in some respects an experiment—the cable system of operating street cars. While in San Francisco, last summer, that city being the birth-place of the experiment, I found no doubt expressed as to their complete success there. But they are only employed on the steep grades of the hills of that city, and the question as to their economy on level streets had not been tested. A line, however, has been in operation in Chicago, which has been so satisfactory that it has been very much extended, and a similar roadway has been put down in Philadelphia. As you all know, Kansas City has granted a charter, and the prospects are that our bluff barrier will soon be overcome by this method. It seems to be peculiarly adapted, as in San Francisco, to our broken topography and heavy grades on east and west lines.

In railway building the aggregate of new road for the year is over 11,000 miles, an increase of more than 3,000 miles over the preceding year. But it may be considered the maximum year, as the prospect for 1883 promises a very marked reduction in railway building. But the indications are favorable for a larger mileage of new road for Kansas City than in some years past.

In iron and coal the product has been very large. The year 1881 was notable for the highest figures ever reached in these great factors of industry, and the past year falls but little below. There are evidences, however, that cannot be mistaken that the production has been beyond the demands of consumption, and a very decided diminution may be expected for the present year.

In the precious metals there has been a decrease in the value of the mine product, which, however, is nominal. Of gold our mines produced $31,500,000, and of silver $44,700,000; a decline of $5,000,000 in gold, and an increase of $2,600,000 in silver.

Beet sugar has been sucessfully produced in California, at the Alvarado factory, a most important fact, and it is confidently claimed that the difficulties

heretofore attending the development of this industry have been overcome. The introduction of new methods has also greatly encouraged the prospect for the manufacture of soda, which, if as represented, is another material event. And it may be said that the production of glucose has kept pace with its remarkable development in the past. The prospect now is that this industry, so unfortunately delayed in our own city, will be in operation here in the near future.

A very interesting experiment has recently been made, both as to economy in operation and in comfort and safety to life in coal mines. It was made before the British Iron and Steel Institute, by Mr. Moseley, and proposes to do away with the use of gunpowder and other explosives in breaking down coal in the mine, by which the igniting of fire-damp and other dangers attending present methods may be avoided. The substitute proposed is the employment of caustic lime consolidated into cartridges by a hydraulic pressure of forty tons. These cartridges are confined in the bore holes in such a manner that when water is forced in contact with them, the force generated by the expansion of the lime breaks the coal from the roof in ten or fifteen minutes. The coal is broken off in mass, with a greatly reduced wastage, fire-damp incapable of ignition, and the mine, instead of being vitiated, as by explosives, is improved in atmosphere. The experiments show the method to be very successful, and it has been introduced in both England and Belgium.

Students of geology will remember that in the tracings of the moraine of the ice period, a gap has existed in its southern boundary, covering a portion of the Appalachian range in Pennsylvania. Prof. H. C. Lewis announces that he has succeeded in closing that gap for a distance of four hundred miles—in fact completing the line from Cape Cod to the Mississippi Valley.

And it is a curious fact that coincident with this announcement of the completion of the line of the moraine and the apparent final verification of the glacial theory, there should come from a very eminent source a substantial denial of the hypothesis. This is to be found in a volume just issued by Prof. J. D. Whitney, whose name is permanently connected with the geology of the Pacific coast. The work is entitled, "The Climatic Changes of Geological Times," is from the Cambridge press, and based on observations made in the great cordilleras of North America.

The theory of the book is that there has been a constant diminution of precipitation from the pliocene to the present time, which is claimed to be shown even within historic time by the shrinkage of lakes and rivers in South America and the interior basin of Asia. But an outline even cannot be given of an argument that covers 400 quarto pages. The point referred to is made, that only in western Europe and northeastern America was the glaciation so extensive as to demand the assumption of conditions considerably different from the present. The environments of individual glacier districts are discussed, and particularly those of Greenland, Scandinavia and the Ural. Precipitation is now large in Scandinavia and Greenland and small in the Ural, which accounts for the extensive glaciation in the two former and the absence of glaciers past and present in

the latter. He does not deny the existence of an ice-sheet, but ridicules the idea of a confluent ice-mass moving in different directions, and attaches great importance to the work of icebergs and rivers. He ignores the erosive powers claimed for glaciers and refers the multitudinous rock-basins of Canada and Finland to chemical decomposition and orographic displacement, asserting that the tendency of streams is to deepen these basins, rather than obliterate them. A wider discussion of these views is promised in a succeeding volume.

In microscopic science the principal event has been the result of experiments by Dr. Koch, of Germany, in the investigation of Pasteur's discoveries in the germ theory of disease. It is the bacterial or parasitic origin of tubercular disease, and consequently of its infectiousness. These discoveries of Dr. Koch were from a multitude of observations in which he demonstrated the invariable presence in tubercular material of myriads of minute organisms, possessing all the characteristics of bacilli, with which he succeeded in inoculating Guinea pigs, rabbits, cats, and other animals with the disease. Not only was this done with tuberculous matter taken directly from diseased animals, but with bacilli which had been taken from cultivation and reproduction in a pabulum extending over a period of six months. These researches are so well fortified that they appear to have met with almost universal acceptance.

The recent storms throughout the country, and the protracted dry season preceding, may make the following fact of interest at this time. While not a discovery to scientific men, yet it has not been generally known that the spectroscope can be used as a weather indicator, by the intensity of the so-called rain-band—the absorption spectrum of aqueous vapor—which occupies a portion of the solar spectrum. Its indications are said to be infallible in predicting the state of the weather for a day or even two days in advance. Spectroscopes for this purpose have been made by opticians, so small that they can be carried in the pocket, and so sensitive and true that a glance through them is sufficient for the experienced observer to forecast the condition of the atmosphere and determine with certainty the coming weather. The principle is this: There is more or less vapor always in the air, and the density of this vapor, more or less, determines what we call wet or dry weather, and the spectroscope shows the condition immediately by its power of discriminating the differently colored rays of which white light is made up. The molecules of water have the power of shutting out certain of those rays and placing them in the order of rainbow colors by the prism and slit of the spectroscope, but transmitting others freely. In looking through a properly adjusted spectroscope at the sky, we see besides the regular series of colors from red to violet, and besides all the thin dark Fraunhofer or solar lines, in one place, that between the orange and yellow of the spectrum, a dark hazy band stretches across it. This is the band of watery vapor. The look should be to the clear sky where it is fullest of light, at a low rather than a high angle of altitude. Any extreme darkness of this band beyond what is usual in the locality of the observer and the season of the year is a sure indication of the abnormal presence and accumulation of rain material, and on the contrary any deficiency

in darkness gives probability of dry weather from the absence of moisture to make rain. A little experience is said to be all that is necessary to make a careful observer an expert weather-prophet in a very short time. Prof. Piazzi Smith, Astronomer Royal for Scotland, during August and September last, fully verified the correctness of the predictions made by these instruments.

In the important field of electric research the interest is growing and the inventions claimed are increasing in number. The direction of greatest activity is toward the perfection of the light for domestic purposes—that for large halls and streets having reached a point where it is no longer considered a problem. For private use the incandescent lamp seems to be most desirable and economical.

The most extensive experiment yet made is that by the Edison Company in New York, which has been in operation for the past year in a considerable portion of the lower part of the city. So far, however, the public have not been informed as to cost, the company not having made any statement on that important point. And as it is one very vital to them, we will possibly have to answer this question, as to the public, by either the extension of the system or a failure to enlarge the area lighted.

But it seems to be the concurrent judgment of the best informed authorities on this subject, that the solution of the problem of domestic lighting by electricity depends for general introduction upon the success of experiments now making upon secondary batteries. The secondary battery is to be supplied to each house and during the day charged to saturation from a central station, sufficient for the demand made upon it during the night. The cost by this method, would be very much less than by direct supply, while the current would be free from fluctuations in intensity, which seems impossible by the other method as well as greatly reducing risks and expense of breakage in lamps. These secondary batteries on the Faure system have been in use on railway carriages in both England and the United States. It is, in view of what we know of the genius and ingenuity of inventors, safe to say that obstacles will be removed and the electric light, so desirable in all respects, become a household servant.

The scientific world has never been agreed as to the nature or maintenance of solar heat. Astronomers and physicists, with the tendency of the intellectual age to refer everything beyond our own globe to the phenomena existing here, have as a rule regarded the solar heat as due to combustion of the Sun's matter, maintained by contraction. This theory has led to calculations, from the mass and density of the Sun, as to the ultimate decrease of heat and the extinction of planetary life. Or in other words, that at some period in the future the solar system is to be one of dead worlds circling about a burnt out central orb.

Without stopping to characterize this ignoble conception of the infinite purpose, of a power and wisdom that perfected such a wondrous system amid a universe of suns and systems, it may on this occasion not be improper to say that this theory has been disputed, and that the debate will not go on entirely upon the amount of stoking that may be needed for the solar furnace, or as to where the fuel is to come from—whether its fires are to be fed by its own substance or

be supplied with meteoric or cometic material, until the vagrant store is all worked up. Another hypothesis is offered.

Dr. C. W. Siemens holds that interstellar spaces are filled with a gaseous matter—hydrogen, hydro-carbons, oxygen, etc.—in extremely attenuated condition. These gases, he holds, are attracted in enormous quantities to the polar surfaces of the Sun, and as they flow in, pass from this state of tenuity and extreme cold to that of compression and a rise in temperature. That finally on reaching the photosphere of the Sun they burst into flame, giving rise to a great development of heat. That the products of combustion—aqueous vapor, carbonic oxide and anhydride—yielding to the influence of centrifugal force, will flow toward the Sun's equator and thence be projected into space. He holds farther, that these projected gases in combustion are forced back by solar radiation to their original condition by a process of dissociation, and that in this direction, or in this office, that portion of the solar energy supposed by scientists heretofore to be lost by radiation into space can be accounted for. This hypothesis he bases upon experiments by which he has obtained unmistakable evidence of the dissociation of water vapor by the simple action of solar rays.

Whether this is to be more than a mere hypothesis like that it proposes to supplant, must be left for farther investigation and discussion, but it has the great merit over the other of rescuing infinite creation from failure, and supplying forever the means for the maintenance of a system that offers every evidence of perfect wisdom in its existence thus far. It satisfies at least human conception of the power and resources of the infinite mind, so far as eternity of phenomena and law are involved. In this respect Dr. Siemens has rendered a very great service to reverential philosophy and to the reason of man.

It may be of interest in this connection to give the result of Prof. Langley's observations to determine the color of the Sun, carried on for many years at Alleghany Observatory, near Pittsburg, and supplemented last summer by experiments on Mt. Whitney, at an elevation of 13,000 feet. Without detaining you with technical details, it will be only necessary to give the results in Prof. Langley's own words, from a paper read by him before a recent meeting of the British Association at Southampton: "The conclusion then is, that while all radiations emanate from the solar surface, including red and infra-red, in greater degree than we receive them, that the blue end (in the spectroscope) is so enormously greater in proportion, that the proper color of the Sun, as seen at the photosphere is blue—not only 'bluish,' but positively and distinctly blue; a statement which I have not ventured to make from any conjecture, or any less cause than on the sole ground of long continued experiments, which, commenced some seven years since, have within the past two years irresistibly tended to the present conclusion." Comment on mere guessing theory and the facts from this eminent authority is only needed so far as to say that hypothesis is not infallible.

Though perhaps not precisely scientific, as we use the term, and not strictly in place here, yet it may be permitted to refer to the fact that the higher science which we term philosophy, is keeping pace in its discussions and investigations

abreast with the physical sciences, interpreting by the light of each new fact, each new form of truth in nature and the symbol it presents to be read.

It is hard to tread in the paths of this field of inquiry without crossing the lines of religious thought and belief, or creed—a department that our Association does not propose to enter. But in the widest sense all these—psychology, biology, and kindred topics—grow out of scientific facts. A truth in nature, the knowledge of which is science, is a whole and universal. The discoveries in electricity, as we have seen, are modifying our views as to the constitution and functions of the Sun itself. And as the Sun is the source of support for all forms of life, it is a legitimate hypothesis to assume that it may have an influence in the origin of life As what we call electricity is now known to pervade everything in nature, flowing out from, returning and controlling, the suggestion logically arises, whether it does not disclose to us, if not life itself, the law of life in all things. It is not necessary to introduce mere matters of faith or belief as to religion into the question, nor on the other hand should we hesitate to grapple with the problem from anything connected with it. The man who will reject a fact lest it disturb a belief, is of as little use in matters of religion as in science or economy. Had this been so in the past there would have been no science—in fact religion, as we have it in this age, would have been impossible.

In this direction we have had in our own city recently a very significant event—the task undertaken by one of the ablest of modern platform advocates, of reconciling the latest achievments of physical science with the teachings of revelation. The importance of this occurrence is in the fact that scientific truth can no longer be discarded by anybody, but must be accepted when found. All departments of intellectual activity must stand in logical relation to the truth, whatever it be. There is not power enough on the earth to-day, if combined all in one, to crush out the humblest truth, in whatever department it may be found. This is the most important and influential fact of the nineteenth century.

As recognized by the distinguished advocate referred to, underlying all knowledge in this direction is the problem of life, its origin and its destiny, and this was the burden of the argument on the occasion we refer to. If, then, it is the obligation of religious thought to be reconciled with scientific truth, it is not improper for us to follow out the lines of inquiry that truth may suggest. And there was one very marked feature in the argument of the distinguished gentleman referred to, that recognized the very foundation inquiry of this age in philosophical science. It was the question raised by microscopic research with bioplasm —as to living matter. This substance is the same in all forms of life, vegetable and animal. The legitimate scientific deduction from this fact is the query: If this is so, is not all life the same, governed only in its phenomena by the form of matter through which it is expressed?

In this inquiry we do not touch upon religious faith, which is based upon miracle—for this assumed there is an end of investigation—but our inquiry is for the law. It is an axiom of the mind, that nothing can be ascribed to miracle if the cause can be found. And it is the highest conception of science that what is

classed as miracle may be, after all, but the supreme manifestation of law. Many things once regarded as outside knowledge and in the domain of the occult have in these modern times been discovered to be as fully the manifestations of law as are the phenomena of water. Religion has its office in the domain of morals, science its function in discovering the nature of things. But a man may be both religious and scientific. If science can demonstrate that man is immortal in its way, surely it is its highest mission as well as duty to do so. And if in so doing it opens new light on other fields it don't hurt humanity, ought not to hurt any man.

The problem is a very simple one, philosophically stated: All manifestations of life are through matter. Taking miracle as claimed in its fullest extent, there is not on record or even from tradition, any revelation to man, except through matter—through man. Accepting fully the "God man," it was through matter, the human organism, that our religion has its sanction. And this matter appeared in form after death and left the earth in material conditions. If this was law, not only as to one, but as to many, as recorded for four thousand years, why should science be proscribed for trying, if it may, to find this lost law? That is the simple question. Is it impious for science to say: If this was the fact for four thousand years, it must have been from a law. And as in all the universe, truth is a whole, why not the law for the last two thousand years? No revelation from God or from beyond the boundary of this life, has ever come to man, except through man—the physical man. Can it ever come in any other way? Religious dogma says no, science says no, and only asks to discover the way, if it can be discovered. There is a law by which life comes through matter. There is a law by which it persists with matter. There is a law by which it severs its relations to matter. Is it then assuming too much to say, that if it ever did come back through matter, as faith holds, there must be a law for that? And if known for two-thirds of the recorded history of humanity, is it not possible still to know it? Why then, in the language of so many travail-burdened seekers after ideals, should it not be let alone—to seek the law in its own way?

Now, this most profound problem of our time is very closely allied with the most fruitful department of physical research—electricity. If not life itself, there is no manifestation of life except through it. It is where there is no life, as we know it, in substances we call dead. It then cannot be life, or life is something more than we recognize it to be. If, then, it is where life is not, but always with life, it must be the medium through which and by which life manifests itself.

And this presupposes that life must be something else—or something not elementarily associated with matter. It then uses matter for purposes of expression. I use the term matter in its natural, not its metaphysical acceptation. And in what has been said there is no difference between science and the advocate we refer to. But it goes far beyond that position in its scope and character—it makes it like any other truth, a unit, a whole—which can be comprehended as of degree, in its manifestations or phenomena. In this aspect there is no necessary difference between the scientist and the man of faith. As the dogma holds, it is above

matter, beyond it, behind it—immortal. And as the man of science asserts from the investigation of its phenomena, it is obedient in its manifestations to the form through which it is expressed—or its environment.

Is there anything here to frighten either? On the contrary, is it not a result to enlarge the conceptions of the one and to illuminate the knowledge of the other? And how much more consistent with all the knowledge we have as to all other things in the universe, each of which is a perfect thing in itself—and in harmony with all things else. It rises to our conception of the infinite instead of dividing life into myriads of specialties while its material forms are all upon one general plan. It is this great law which, from the study of comparative anatomy, has caused men to stumble over the dogmas manufactured from revelation, because the one was totally irreconcilable with the other. But here is common ground for all.

The next step is the inquiry, how are we to know this life? Theology tells us that the books are closed, and we must find it from what we have. But the books were closed before Galileo, or Kepler, or Newton were born, and the thunder was the voice of God before Franklin drew its secret from the cloud. And there are still places where this voice is silent and has ever been. The chosen people of heaven never heard this voice of their Jehovah until camped before Sinai where Egyptian aridity was replaced by the warm and vapor-laden currents from the Indian Ocean. The book is open, has been open since the morning stars sang together—open to us if we will read it. And the fundamental truth of all religions—the immortal impulse of humanity—will yet be made plain by the questionings of science. For the lights of reason, philosophy, and religion, all teach us, from every summit of human progress down through the ages—that there is nothing necessary for the well being and development of man and his happiness on the earth, that is hidden beyond his ability to know if he but asks aright. To reach this knowledge of his immortality—to know it—is the highest unfoldment, the consummation of humanity—from which immortality is but stepping over the border between the world of matter and the world of life itself.

In view of the proposed meeting of the British Association for the Advancement of Science, in Montreal, in 1884, a committee consisting of Messrs. H. Carvill Lewis, Edward D. Cope, Persifor Frazer, Angelo Herlprin, and Henry C. McCook, has been appointed by the Academy of Natural Sciences, of Philadelphia, to secure the co-operation of other societies and institutions of the city, in extending an invitation to the American Association for the Advancement of Science to meet in Philadelphia the same year, directly after the Montreal meeting, so as to increase the facilities for communication with the British Association. Similar action has been taken by the American Philosophical Society and the Franklin Institute; and the University of Pennsylvania has offered the use of its halls for meetings.

ENGINEERING.

HYDRAULIC ELEVATORS AND MOTORS.

B. F. JONES, KANSAS CITY, MO.

(*Read before the American Water Works Association, at Buffalo, May 16, 1883.*)

What I have to say in relation to elevators and motors will be mostly in regard to questions that their uses necessarily bring up for settlement at the Water Works office; also to show how I have been able in a measure to overcome some of the many difficulties that have presented themselves, as well as to discuss and seek information as to the best way of meeting others that still have to be dealt with. At the outset, therefore, let me state that I am not an hydraulic engineer, nor have I sufficient mechanical knowledge to undertake the discussion of the construction, or relative merits of either elevators or motors. This I would respectfully suggest as a very proper and interesting topic for a paper at some future meeting by some one of the many eminent engineers of this Association.

The Water Works of Kansas City are comparatively young, and my experience only dates back six or seven years, or since shortly after their completion. At this time it was deemed advisable on account of the probable large revenue to be derived from their use, to encourage the putting in of hydraulic elevators by low water rates. With this end in view a number of contracts were made for their supply at low, special rates for a period of years, and our minimum meter rate was charged in all other cases, regardless of the quantity of water consumed. In most instances these special rates have since been found much too low, parties paying in this way being exceedingly extravagant in the use of elevators. However, the object sought was obtained, and now they are very extensively used. In fact so much has their use increased, that the question is no longer how to encourage their more general adoption, but how to properly govern those that must be supplied. At present our works furnish power to about fifteen passenger and eighty freight elevators, and the number is rapidly increasing.

Before going into details, it seems proper to give, at least a brief description of our water-works, as my observations are to a great extent local.

On account of the peculiar topography of Kansas City, two systems of water supply have been provided, the high ground being supplied by direct pumping, and a pressure of about ninety pounds maintained in the business portion, and the lower part of the city being supplied by gravity, from a reservoir at an elevation of 210 feet, thus giving the business portions of the city, on high and low ground, about the same pressure. By an arrangement of valves, a combination of these two systems is effected, so that the Holly machinery can furnish an

increased fire pressure at a moment's notice, into either or both pipe systems. Thus at some points the pressure is extremely high during the progress of fires, causing difficulties that do not exist where the gravity system is used exclusively.

Elevators have become an established institution and in cities of any commercial importance, are regarded as a necessity; hotels, jobbing houses, factories, and office-buildings being considered as far behind the times when not thus provided, as a city without a water-supply or a community without a "boom." The use of elevators has made it practicable and profitable to erect buildings twice as high as were formerly thought of. Perhaps some of the most notable examples of this are in New York City, where such structures as the Mills Block, the buildings of the "Tribune," "Evening Post" and Western Union Telegraph Company, tower high above the surrounding blocks, monuments of architecture that, without this modern invention, would reflect little credit upon their designers. If then, they have become such a firmly established institution, their bearing upon the water-supply of cities is a subject to be carefully considered.

As before intimated, there are many questions involved in the use of hydraulic elevators, that particularly concern towns supplied by direct pumping, and perhaps other places where the supply by gravity is somewhat limited. In a few larger cities supplied by ample reservoirs and mains, some of the difficulties suggested are not serious. Very little power is necessary to perform the actual work of lifting, with either steam or hydraulic elevators, but on account of the peculiar application of the power and the great amount of friction to be overcome, a very considerable power has to be provided. It has been estimated, by good authorities, that not more than one-quarter of the power expended in most cases, is really utilized.

With all hydraulic elevators of which I have cognizance, as much water is required to raise the empty cars as though they were loaded to maximum capacity. Still, to be available for passenger purposes, elevators must have capacity of upward of 2500 pounds, particularly in hotels where the cars are often arranged with separate compartments underneath for baggage. In general use it is exceptional that passenger elevators are fully loaded, on the contrary less than half a load is ordinarily carried, and for this reason it would appear that no actual benefit is derived from at least one-half of the water consumed. In this connection it has occurred to me that passenger elevators could be built at no great additional cost, with two cylinders, small and large, the two piston rods of which could be connected so as to both operate the same cable, either or both furnishing power. The smaller cylinder to be used for light loads, the larger for heavy work, and the two together for full capacity. This independent valve arrangement to be controlled by a separate cable running through the car. Whether this plan is practicable or not must be left to elevator manufacturers, but it seems to me that with the Hale Otis Elevator, for instance, (which is conceded to be one of the best) it could easily be accomplished. Certainly some such arrangement would effect a great saving of water, and perhaps bring water bills to a point that this class of consumers could afford to pay.

Hydraulic elevators where the water is used over and over again, by being pumped from the discharge to elevated tanks, cut little or no figure in connection with a city's water supply. When fuel, first cost, attendance of an engineer, and the poor economy of the class of pumps usually employed to perform this work are considered, the cost of operating such elevators is greatly in excess of what it would be if power were supplied direct from water mains, at any reasonable rate. The following remark will then relate almost exclusively to that class of hydraulic elevators supplied with power directly from the water mains.

Let us now consider whether they are a desirable source of revenue, and in this my knowledge does not exceed my actual experience. Few elevator users appreciate the great quantity of water their elevators consume; even in Kansas City, where, on account of the high pressure carried, much smaller cylinders than ordinary are required, it is found that passenger elevators frequently consume 500,000 to 800,000 gallons of water per month, which will make a very considerable bill, at the most liberal rates. I have therefore concluded that the quantity of water was so large that, unless liberal concessions were made, it would be a hardship to consumers to pay their water-bills, and have therefore made a special schedule according to quantity, for elevators and motors; these rates starting below our regular meter rates, and running to the lowest point at which we think we can afford to furnish the water. This schedule brings the rate below what we would receive for almost any other legitimate use of water, and in view of our rapidly increasing consumption, and the probability of soon having to increase all our facilities, it is an open question whether this will continue a desirable source of revenue.

In Kansas City we have elevators of various manufacture: the Hale Otis, Ready, Smith & Beggs, O'Keefe, Kennedy, and perhaps others, each having their peculiarities, but alike demanding large openings in the mains for supply. These large openings are objectionable features with any water-works, and especially so with direct pumping. An occurrence from this cause, about two years ago, is an experience I should not like repeated, but is one that might occur whenever the pressure in the mains is depended upon to throw fire streams. In this instance a large block of buildings occupied by jobbing houses, and having three elevators, was burned down, and the elevator connections broken early in the fire, allowing the water to pour into the cellars in the volume of about twelve ordinary fire streams. This immense quantity of water had to be supplied from a six-inch main, fed only from one end, which left little pressure available for fighting the fire, and as a matter of course failure to subdue the fire promptly was attributed to the water-works. We have since had up hill work to restore confidence as to our ability to throw fire-streams, although we have demonstrated the fact hundreds of times since. From this time we have been gradually cutting down on the size of openings for elevator supply, but under protest of the elevator agents, who have always claimed they should be allowed at least a four-inch opening in the mains, until we have found that under eighty to ninety pounds pressure, two to four one-inch taps will answer the purpose, provided the water-

pipes are of ample size. The "water-hammer" produced by the quick-acting valves of elevators has always been objectionable, both in its effect at the pumping-house, and upon water-mains and connections. To obviate this, Engineer G. W. Pearson has suggested the use of very large air-chambers on the elevator supply, and still smaller openings in the mains; his theory being that the air-chambers would not only materially decrease the concussion or "water-hammer" but that they would also act as accumulators of power (or water under pressure) to be drawn from, at each trip of the elevator and replaced when it was at rest. This plan I have never seen put to actual test, but believe it to be entirely practicable, and that we will have to ultimately adopt. All things considered, the plan of operating elevators from tanks in the top of buildings, supplied by a small pipe connected with the water-mains, and arranged with a float-valve to keep the tank filled, I believe to be the best manner of supply, except for the great additional cost of putting up such apparatus. By this arrangement the amount of water consumed is no less, in fact, it would ordinarily be more than with a direct connection with the mains, but it has the advantage of taking the water in the least objectionable manner. Still, if this mode of supply were generally enforced, the large first cost, and additional expense of operating, would undoubtedly deter many from using elevators.

Another evil in connection with the use of elevators, and which, no doubt, is common, is the habit many parties have, of keeping a key or wrench to turn on and off the water at the curb. This we have sought to remedy by embracing in our Plumber's Rules the following: "All elevator connections in addition to the curb-stop for the use of the Water Company must be provided with another valve where the pipe first enters the building for the use of occupants of the building." Without this extra valve it was found almost impossible to keep parties from using the curb-valve. In most cases the persons were responsible, and as there was no intent to defraud the Company by the act, they would claim this privilege as a precaution against the pipes bursting or freezing. This practice was very generally carried on, and was the direct cause in at least two cases of very serious damage. In the instances referred to, the pipes burst between the elevator and the area wall of buildings, and the valves outside had become so worn from frequent use, that they would not operate, allowing the water to literally deluge the basements before the water-main could be turned off.

One of the greatest causes of waste from elevators is the wearing out of the piston-packing, this being particularly troublesome in most of the western cities, where the water supplied is to a large extent from turbid streams, carrying more or less fine sand or "grit," which cuts out the packing of the pistons very rapidly. The only practicable remedy for this is close inspection, to see that the pistons do not allow water to pass, a fact that can be readily determined from the noise made in the cylinder when the elevator is in motion going upward.

I have reserved one of the most annoying features of elevator supply for the last, hoping to work myself into a mood to do the subject justice, but doubt if it can be done in language proper to use before this dignified body. I remember

on one occasion the mayor of our city, in discussing a job of plumbing, said that it seemed to him "that even a plumber ought to know something about plumbing." Now it would seem that even elevator agents ought to know something about elevators, but from the following incident, which is but one of many, I am led to believe that they are not infallible, to say the least. Only a short time since one of these very reliable(?) agents reported at our office that he had just attached a new indicator to the elevator of a leading hotel. He was asked: "What does it register?" and promptly replied, "Cubic feet." In this case our inspector had already made an examination, and had correctly reported as follows: "Hale elevator; indicator started at zero February 28th; internal cylinder twelve inches: Travel of piston for complete trip, thirty and a quarter feet; indicator registers for complete trip, 4.

When it is understood that we had for a long time been assuming that elevator agents knew about all there was to know on the subject, a comparison of the statements of this agent and our inspector is somewhat startling. Now let us see what the difference amounted to: At the end of the month the indicator had registered 12,994; calling it cubic feet, this register would equal 97,195 gallons. According to our inspector, this same register would equal 578,233 gallons, or a difference of nearly half a million of gallons for a single month. Our experience with the agents in Kansas City has shown that they will, if allowed, put any kind of an indicator on the most convenient point of any sort of an elevator, without the slightest regard as to what it was intended to indicate; then report it as registering cubic or lineal feet, whichever they find the indicator marked. On the same principle they could as well change the fulcrum of a Fairbank's scale, and then claim it weighed pounds correctly, because pounds were marked upon the bar. We have lately prepared a blank, upon which these agents are required to make a detailed report upon the completion of an elevator before the water will be turned on, which it is hoped will to some extent correct this trouble.

I have come to regard an elevator indicator with a feeling of wonder. Some years ago, when the "planchette" first came out, I remember that it acquired quite a reputation as a particularly erratic piece of mechanism, but for real mystery and innate cussedness, on general principles, commend me to the indicator. Why, I have known an indicator, after registering a nice water bill, deliberately and without provocation commence taking it all off again, by going backward. This crab-like maneuver the agent readily explained by saying the "ratchet had turned over," but even he was unable to show us how to make the bills after these peculiar gyrations. I also find that it is quite a favorite amusement for indicators to stop entirely, like a balky horse, after which no amount of persuasion will bring them to a realizing sense of their duty. Even at the best, these indicators are very apt to get out of order, necessitating greater watchfulness in supplying elevators than for any other purpose for which water is furnished.

Accidents in connection with the use of elevators are common throughout the country, and in Kansas City had, until within a short time, become of altogether too frequent occurrence. The great cause of this, I believe to be due to the fact

that the parties who usually operate elevators are the very ones who know the least about them; the corrosion of pistons, crystallization and oxidation of cables, and many other disorders common to elevators, being matters they do not comprehend. The frequency and fatality of these accidents in Kansas City finally led the city authorities to appoint an elevator inspector, who is under heavy bond, and whose duty it is to examine every elevator at least once a month, and to grant license to run only to such as he deems in safe condition. Thus far since the establishment of this office, we have had no serious accidents, which leads me to the belief that in most cases a monthly examination will discover in time the causes of many terrible casualties; also that it is not safe to operate elevators unless so inspected by some competent person.

The hatchways of elevators in large buildings are points greatly feared by firemen. They well know that when a fire once reaches this shaft, it takes but a moment for it to be carried from floor to floor, until the building is soon past saving. Although this great danger is well known, it is the exception rather than the rule to provide elevators with fire-proof hatches. A properly constructed elevator should, it seems to me, be provided with hatches, or better still, built within brick fire-proof walls, with openings to be kept closed when not in use. In this way costly buildings, valuable merchandise, and many lives would be saved from fire every year.

Although considerable has been said on the subject of elevators, I am aware that the ground has not been covered, and that difficulties have been pointed out, rather than remedies suggested. There is much yet to be brought out by the engineers, to whom the subject more properly belongs.

In the meantime, although elevators claim many of the objectionable features in the business of water supply, most of them are not of a nature that should condemn their use; on the contrary I hope that with the joining of our experience there will be an improvement in the methods of their supply. Inasmuch as they must be furnished with water, all that can be done is to adopt such rules, and fix such rates as will compensate in some degree for their objectionable qualities.

WATER MOTORS.—My remarks on this subject I trust will be more to the point than they have been upon the questions already discussed. Certainly my ideas are more decided so far at least as supplying water motors is concerned.

In many respects I believe water motors furnish as nearly perfect power as it is possible to attain. A motor, for instance, properly connected and supplied by the even pressure from a reservoir is probably the most reliable and steady power known, not excepting the most improved and costly steam engines. The convenience and little attendance necessary in operating, make them especially desirable for many purposes. Where only small power is required, or even where considerable power for only occasional use is desired, they are particularly well adapted and can be driven at small expense. Even for greater power they possess advantages over steam engines which, to a considerable extent, compensate for the large water rates that ought to be paid for their supply. These advantages are, in

the first cost of a motor, as compared with a steam engine, the saving in attendance and fuel, the convenience and cleanliness, and in some cases a saving in insurance by reason of there being no fire risks attendant upon its use. At just what point steam becomes preferable, however, is a question depending considerably upon water-rates, but to some extent on other circumstances, leaving it largely a question of judgment. As with elevators, there are difficulties involved in their supply that unless carefully guarded make water motors anything but a desirable source of revenue. How often is the argument advanced: "Why, I only use water for a quarter of an inch jet," showing how little people who use motors or elevators or fountains realize the quantity of water they consume. This class of consumers may be placed on one footing, to-wit: a class who, in spite of the fact that they are supplied with water for much less than any other, feel that they are imposed upon, and cannot be made to think otherwise.

Though not as large as for elevator supply, water motors require liberal openings in the mains, and frequently the fault of having too small supply pipes, is sought to be remedied by openings in the water mains much larger than needful. A table prepared by an engineer who had given the matter study, or by some motor manufacturer, showing the size of taps, or openings, for the proper supply of motors, with the various jets, under different pressures, would be of general use to water-works people. In order to use water to the best advantage, the full pressure in the main, so far as practicable, should be had at the jet, but in order to accomplish this it is not necessary to use as large taps as are ordinarily demanded, but to provide supply pipes of sufficient capacity to deliver the water to the point of discharge with the least possible friction. Lately this theory has been put in practice to some extent by us, and the result has shown that in this manner we are able to supply motors through smaller taps than before, and with as satisfactory results.

It is a general practice throughout the country to make annual or monthly rates for water motors, and from my observations I believe I can safely venture the assertion that in three-quarters of the cases the rates charged will not equal fifty per cent of the lowest meter rates in force in these places.

I have made some estimates myself for water motors, basing rates upon the number of hours it was claimed the motors would be in use, and afterward supplied the same motors by meter measurement, and in every case found that at least twice as much water was used as had been estimated. Although estimates were carefully made upon what was believed to be a reliable basis, these repeated similar results have lead me to the conclusion, that the only way to supply motors is to make it an object to the users of them to be economical. In other words, I believe the way to supply water motors is upon an estimate that they will run twenty-four hours per day and 365 days per year, or more properly still, supply them only by meter measurement. At all events this is henceforth my policy, or in other words, "On this rock I stand," believing it the only equitable way out of this difficulty.

That class of motors, or water-engines, operated by water-pressure in close

cylinders upon pistons, as with steam in a steam-engine, I believe could be easily supplied by measurement of water without a meter. This could be accomplished by the use of "revolution counters" or indicators, as the amount of water required per revolution could be readily determined, and when once computed the cylinders would measure out the water as accurately as a meter. The only objection to this plan is the expense of counters, which is considerable; and as to indicators, it may have been observed that I have little faith in their reliability. With cheap revolution this class of motors would be free from many of the objections raised in regard to motors generally.

The practical conclusion that I would draw from a consideration of this subject, is that the question of whether the supply of hydraulic elevators and motors is desirable in its effect upon the water supply, is one that hinges so delicately upon their being carefully governed, connected and restricted, that while on the one hand they may be made the source of large profit, and at the same time a public benefit, on the other hand, unless all the details of their supply be carefully guarded by the wisest rules and greatest watchfulness, their capacities for waste are so great and the rates charged necessarily so low, that they may become the greatest source of loss with which we have to contend. I therefore trust that this discussion will be continued until an interest is felt that will result in our all receiving much useful information upon two most important factors of our business.

As this paper has been long for the information contained, I will close with the earnest wish that it may at least be of service in bringing these important, but often neclected subjects, to the attention of this thinking and intelligent body of men, of whom many have had much longer and more general experience in relation to these matters, and whose views when expressed will consequently be of more interest and have greater weight. Thus as a result may we all derive the benefit of whatever useful information there is to be gained by this annual interchange of experiences, in the all-important business of public water supply.

VILLAGE IMPROVEMENT.

ALBERT E. WELLS.

The marked difference between the European and American village is worthy of a passing notice before we go to our immediate purpose. There the gathering in the neighborhood of some baronial castle gave form to the village, while in its younger day, to what afterward became the city. The protector was in many instances the one from whom the citizens most needed protection; but it was easier to satisfy the rapacity of one than many. So they were grouped together, who were dependent on the feudal baron, and held their rights of land and home from him. And convenience of protection was the important consideration in selecting the location. The same motive led to limiting the area of

the village; so that the quiet, sequestered home, which in this land is a usual sight, until recent times was unknown to Europe. The village in the olden time meant, I believe, the habitation of the baron's villains, the villains did not mean the rascals but the toilers of the land, who were not to be parted from it.

Neither the motives forming the old village, nor its customs have any perceptible connection with the modern idea of it. They are alluded to only that we may the better understand the older writers who have handled this subject, for it has been a theme of great writers. Virgil, in the pastorals, had occasion to speak of "the restful, untroubled village life." Tiberius in the island of Capri, took greater delight in the affairs of its vil age life, than in those of the Empire. Lord Bacon regarded it as a thing to be provided for, and made an element of his garden and so governed it as to be an object of beauty in the landscape. From Washington Irving's description of Spanish village life, one would judge that the placing of the village and pretty much all its construction had been the care of some one, thinking more of his own convenience and economy, than of theirs who should live in said villages.

The interval between these writers in the matter of time gave rise to a great many changes; yet the present is but a child of the past, and as such shows its parent's features. It is admitted that in matters of the outward life we are vastly gainers upon the past, but we have lost the charm of effective grouping, and an isolation, which is oppressive, especially to the younger people, has taken the place of such village festivities as are described in the "Deserted Village" and the "Vicar of Wakefield." We gain a greater sturdiness of character, and a greater self reliance by having no neighbors on whom to call for help or amusement. The steady stream of migration from the farms and the country to the cities indicates the desire for a greater attractiveness in the village homes.

The village of the present day and in our land is a great gain upon the past. Of it we now speak. Those of the smaller sort are in main peaceful and thrifty, the homes of a worthy and industrious class, mostly tillers of the soil, or those engaged in works that are dependent on the farmer. The predatory baron has disappeared, and the villagers are not necessarily villains in any sense of that hard word.

A closer grouping might give rise to greater convenience and many added beauties. The little patches of marigolds and roses mingled with grape-vines, pinks, cabbages, and beets that do duty as garden are capable of improvement by a wider separation. If the good housewife's array of flowers had a limited area and that joined by another of about the same size, and so on a row of them, say fifty feet in width by seven hundred in length and then around a square fairly planted with various kinds of trees, the poor posies would not look so lonely, but form part of a scene of beauty, especially if a well-kept green sward bordered the beds and the walks. While a similar array of vegetables in the areas behind the houses would form a scene assuring to the hungry, and provident against the season when no outdoor growth is possible. The new wire fences are a sufficient barrier, if one is needed; upon the front it is better to have

an invisible line, whose whereabouts can be determined from a hitching-post beyond the walk and centre-post in the lattice which divides the front yard from the regions that lie beyond. No fence is in any sense an ornament. It may be utilized to hide things more objectionable than itself. The stores and shops should conform measureably at least to such rules of comeliness as not to mar the effect of neatness, which well kept front areas would leave upon the eye. The blacksmith may insist on having a front view from his forge that does not include all the crippled agricultural implements of the neighborhood and a walk that is not the receptacle of old iron. The store would lose none of its attractions if a fountain played in front, and its drainage gave a drinking place to thirsty horses on the outer edge of the walk, instead of the present array of broken boxes and old barrels.

These are easy lines that lie open for the improvement of our present village.

The planning of a village, laying it out and building it out of hand has come to be one of the duties of the modern architect. The suburbs of our great cities afford illustrations of their success. An account of one in London some time ago appeared in one of the monthlies, and reference is hereby made to the beautifully illustrated articles in the monthlies for ideas and thoughts on the subject of beautiful gardening applicable to all sorts of life that are represented in our ordinary villages and towns.

Now, what applies to the village, applies to the town in a larger way and requires that greater care should be exercised; for then questions of convenience, health, taste, and wider utility come into consideration. So that towns of from 3000 to 5000 inhabitants would be gainers by having a new laying out of the town plat under the direction of some one competent to the task, in order to make suitable provision for a supply of wholesome water, and proper drainage, and if, as in many places they are now doing, we include the lighting and heating of residences, we would, I believe, have all the things provided for that the town builders expect to do. The Goldmaker's Village, of Chamber's Miscellany, is a great ways behind the the time, and out of place as well, I think, in having all the household work done in common over the same cooking stove and possibly in the same wash-tub. The communistic ideas of Fourier are in a just discredit, while a timely thrift and comeliness may be greatly advanced in these lesser details, by a steady coöperation. And they may chance to have a commercial value, that will make them worthy of the attention of those who scoff at everything above the servilely useful, as unworthy of their regard. As witness the advance in real estate in Stockbridge Mass, brought about largely through the added charms of that village, wrought out by the Laurel Hill Association.

If beautiful adornings had no reflex influence, this whole subject might well be relegated to the limbo of the useless and the worthless; but the better surroundings both indicate and bring about a better inner life; like the author's book that was made more orderly and greatly improved by a revision that was made upon a table of contents gotten up by the author's friend. We all know that neither a table of contents nor a bill of fare will satisfy either thought or appetite; but they

give promise of satisfaction. So a well arranged village or town or home of well ordered life and thought within, will render such things easier to all within. If our minds are at ease on the wood and water questions they are by that much the better prepared to take up the music and painting, and Ruskin says, "the more piano we have the less savage we have."

The Olney hymns and other beautful thoughts of the author could not have found utterance but for the shelter of Mrs. Osborne's beautiful home, whose quiet ordering saved from utter wreck the gifted William Cowper. Sunnyside and the beauties of the Hudson shine upon the pages of Washington Irving. The best conditions for work will ordinarily produce the best work and the most of it. The saved and added mental strength, that lies in these things, is no inconsiderable store.

The mental and moral worth that is shown by and through them is a thing more noticed. It is hardly needful that I should speak of the refinement that shines through the window made beautiful with flowers. The hearts that make room and time for cherishing these speechless beauties cannot be rude, coarse, hard, or unfeeling. The hand that make beautiful the yard is apt to indicate a heart that looks beyond the doorsill of a personal selfishness, and the grouping of such homes would point out the region where a friendly hearted man would love to have his home; where he might expect that neighborly sympathies would expand to his own heart's gain, and community of interests and pursuits lead to improvements in all the common interests of life.

MEDICINE AND HYGIENE.

UNCOMMON DISEASES IN PERU AND BOLIVIA.[1]

EDWIN R. HEATH, M. D.

"VARRUGA DE SANGRE," *Verruca Hœmorragica*, (BLOODY WART).—Prescott in his "Conquest of Peru" mentions a peculiar disease which attacked the Spaniards during their wanderings among the mountains, to which they gave the name "Varrugas," their name for wart, owing to the excresences of the eruption resembling warts.

1 In submitting to your readers the accompanying article I have avoided as much as possible technical names and theories. As a traveler, the facts which might be useful to know are sought after and simply recorded.

Published in a medical journal, this article would need to have been more explicit, and then it would only have reached a certain class of readers.

Only striking specialties have been noticed, yet much might be written on the diseases of those countries which might be useful as determining the geographical distribution of disease. For instance, in the mountains of Bolivia, especially on the eastern slopes, cataracts and opaque corneas are very common, not differing from other places except in their abundance. This subject alone, presented in all its merits, would be valuable to scientists, but this not being a treatment of the geographical distribution, it and many other similar facts are not touched on.

In 1871–2, when the Callao, Lima & Oroya (now Trans-Andine) R. R. was in course of construction and had its terminus at the present station of San Bartoleme, thirty-nine miles from Lima, with its camps extending some ten miles beyond, the workmen were attacked by severe and distressing pains throughout their entire bodies. At first, the attending physician supposed them to be rheumatic, but their ceasing as soon as the eruption appeared, proved them to be the promonitory symptoms of "varrugas". The eruption consisted of a fungus, spongy outgrowth from which blood oozed upon the least touch and often spontaneously. Their size varied from the size of a pea to two and a half inches long by one in diameter. The roots perforated the derma when external and the muscular coats when on the mucous membranes. The eye-balls, nasal, buccal and vaginal cavities not escaping, and post mortem examinations revealed the mucous and serous coats affected with smaller but similar warts.

There were three varieties, the large, distinct, spongy wart; the confluent undeveloped eruption, resembling variola, with rounded instead of depressed center; and that fine eruption as if millet seed were between the derma and epidermis. The two last were occasional after-effects of the first. A patient having the first, upon recovery, might have the second and, barely better of that, break out with the third, or intervals of from six to twelve months might elapse during which time perfect health was enjoyed. Again one could have either without the other, although none were ever known to have them in the reverse order, and once having they seemed to be protected from a repetition except in the passage from the first to the third as above mentioned. If the eruption did not appear, if they appeared internally, or the first variety was very abundant, fatal hæmorrhages or paralysis occurred. Except for the pains and annoyance from the loss of blood one could attend to his daily duties.

A ravine, some six miles beyond San Bartoleme, bears the name Varrugas. The general disinclination of the native Indian to bathing in cold, mountain streams, and their statement that the varrugas resulted from baths in the stream of that name gave that as its origin, which for a time was believed.

The unprecedented magnitude of the work attracted many visitors, most of whom came with fear of the varrugas, and great care was observed not to touch water, either as a beverage or article for cleanliness. Passengers, arriving at 11 A. M. and leaving at 1 P. M. abstaining from food and drink and shunning water as one attacked by hydrophobia, did not insure them against the disease, many breaking out within two months of their visit to the varrugas region, and often these were the worst cases. Others worked there for years, drinking and bathing, with impunity, in all kinds of water.

A few, after they had returned to the United States or Europe, at the end of one and two years were attacked, so that the period of incubation could be said to vary from six weeks to three years.

Three hundred miles north of Lima on the Pacasmayo, Guadalupe & Magdelina R. R., at the station of Chilete the same disease broke out but less violently.

Varrugas ravine, on the Trans-Andine R. R., is sixty three miles from the coast

at an elevation of 5,340 feet; Chilete, on the Pacasmayo R. R., is sixty-five miles from the coast at an elevation of 3,700 feet. The breaking up of the earth and rocks, during the construction of the railroads, apparently filled the air with floating germs or mineral poison which entered the system through the lungs and was then carried to the capillaries where it took root and was nourished by the blood or caused an unusual growth to wash out the poison. As yet the point is unsettled, although all discard the water theory. After the roads were finished and the ground settled the disease disappeared.

At the time the varrugas disease was at its height, a fever resembling sporadic yellow-fever broke out on the Trans-Andine R. R. and by many was considered as one with the varrugas. Dr. Logan, ex-Minister to Chili, while in Chicago, wrote a work on the diseases of the west coast and had classed them as Varrugas or Oroya Fever. Happening to call on him at this time, the author being in the transition stage between the first and second varieties and having no fever nor having had any, proved that the diseases were two and distinct.

"MAL DE SIETE DIAS" (SEVEN DAYS SICKNESS).—On the coast of Peru as far south as the 12th parallel of Lat. anger will so change the milk of a mother that it will cause the death of a child within seven days. Should a mother wish to free herself from the labor of raising her child she lets herself get angry, puts the child to her breast and the end is sure. It is an every day occurrence for a mother to send her child to a neighbor requesting that it be nursed, saying she had been angered by her servants, or children, or some one. In an hour or two the effect passes off and the milk becomes good even though left in the breast and a deadly poison but a short time previous.

"AIRE" (AIR).—By this is understood a change of air that acts perniciously upon the human system, either in perfect health or debilitated by sickness. In the hospital of the Pacasmayo R. R., where from 100 to 180 sick and wounded were cared for, all would be doing well, wounds granulating and painless, convalescents happy in the thought that but a day or two more and they could go to their work. Suddenly, with no change of barometer, or thermometer, or electric tests, the wounds would turn black, gangrenous and painful, and the wards, so silent five minutes before, would be filled with groans, vomitings, and fevers. This would last for three days and then go as it came. At these times one would have the muscles of one side of the face contracted or the head drawn on one side or the body bent back or to one side. The least exposure in a draft at any time would be liable to cause these same effects, but at these times more readily. Often cooks and nurses were made ill, so that no one was free. Six years of careful observation failed to detect the cause. Chemical tests were made, the microscope used faithfully, thermometers, barometers, and magnetic machines watched. The Ocean's temperature and currents, as also the air's temperature, currents, force, direction, and weight noted four times a day, and we are free to confess, we acknowledge the fact, but why we never could detect.

In Peru the climate being such that many sleep out doors, gives opportunity for an occurrence like the following which causes several deaths among children

each year. There exists a snake of the boa-constrictor species which lives upon vermin and is protected by the owners of estates for their utility. They, however, are very fond of milk and at night quickly find where the nursing mothers sleep. Noiselessly approaching they coil themselves beside the mother and while they rob the child of its nourishment they keep it quiet by inserting the point of their tail in its mouth, and thus the child wastes away from insufficient nourishment. The author of this was inclined to scoff at the story, but assured of its truth by such men as Dr. A. Arrigoni and Prof. Raimondi we had to accept it and give it believing it to be true.

RING-WORMS, *Herpes Circinatus.*—On the River Madeira, in Brazil, nearly all the workmen on the Madeira & Mamore R. R., were attacked with ring-worms; some lightly, others over the entire body.

GOITRE, "PAPERAS," (GOTTO).—Arriving at the towns on the plains of north-eastern Bolivia we were surprised to find so many cases of Goitre. At least ten per cent of each village had either single or double goitre, the females exceeding the males in proportion of six to one. Both children and grown people—Indian, Negro, or white, all were affected. In a town near Santa Cruz de la Sierra, $\frac{99}{100}$ have it, and some assert that it even attacks animals. As these people live on low lands, far from mountains and snow, many never using water that did not come from wells fed by the rains, it must be acknowledged that the theory of the "snow-water cause" must be discarded. Besides, those who live at the base of the mountains and who might be considered as using water that had once been ice and snow, are entirely free or probably in proportion of one in twenty thousand. These facts, so at variance with the acknowledged belief that in other places holds good, makes it a subject of interest worth more than a hasty thought. The region drained by the Yacuma River lies between two water-sheds which run nearly parallel at that point separated by 200 miles. This region is a low prairie grazing land, and all the water that feeds the river comes from the winter rains, and the most ardent supporter of the snow theory must grant that his theory is at fault. At no time in the life of the female can one say it abounds more than at another, as in some parts. Could the winds bring it from the mountains? The winds come from an opposite direction.

"ESPUNDIA," (MALIGNANT INDOLENT ULCER).—In the Department of Caupolican, in Bolivia, there are some cities of consideration, among which is that of Apolobamba. The pasture lands about that city are insufficient to supply all the cattle needed for beef, hence they are very dear. On the plains of the Department of Beni cattle are abundant and cheap. As a natural consequence there exists a traffic in cattle between those two Departments. The droves pass the River Beni at Rurenabaque in S. Lat. 14° 26′ 21″, thence along the base of the mountains northwest to Tumupasa, then turning west, cross the intervening ridge, descending to the river Tuichi at San Jose, cross it then by dangerous and difficult mountain paths to "Apolo." This latter part must be passed on foot, as no horse or mule can travel there loaded. It is during this passage on foot that the traveler is exposed to the Espundia. At first it appears as a small pimple,

generally upon the lower extremities, between the knee and foot. This pimple grows rapidly and is painless. Soon the top decays and drops out leaving a cavity with raw, red, irregular, ragged edges. When the ulcer, if on the lower extremities, has spread to two inches in diameter its further growth is very slow. Many times it breaks out in the nose and then the ulcers on the other parts heal. From the nose it spreads all over the antra, sinuses, mouth, throat, and in places on the face, eyes and ears. The ichorous discharge from the nose and throat is fetid; that from the external ulcers less so. Actual cautery with a red-hot iron will kill it in the start but excision only hastens the formation of an ulcer.

Many fatal cases occur, but the majority heal in five or six years.

Opinions differ as to the cause. Some assure you it is a sting of an insect, some of a nettle, while others claim it to be a mineral poison which passes into the circulation through some abrasion.

The actual cautery by arsenic followed by internal minute doses will cure seventy-five per cent.

GRUBS OF THE OESTRUS FLY.—One of the unpleasant annoyances of a life in the forests about the Amazon and its tributaries is the deposit in the body of eggs by the Oestrus Fly. These eggs soon hatch out worms which grow to one-quarter of an inch in diameter and three-quarters to one inch in length. We have seen birds with their bodies full of these worms. Their usual place of deposit on the human being is the nape of the neck. But this is trifling beside the itching produced by the bites of a minute insect, the "Acarus Scarlata." Wherever there is grass or pasture lands in these low, damp countries this insect is found, but more abundant in the dry season. As soon as it is filled with blood it can be seen as a red speck at the root of the hairs of the body in the folds of the navel and nipples. During the month of its greater abundance none escape without scratching themselves raw, often forming distressing sores. One learns to shun the grass. The public squares and spaces about the houses are carefully kept free from it. Nor are the forests free from pests. One of the duties of a hunter in the Amazon forests is occasionally to strip off all clothing and pick off the small woodticks before they burrow under the skin. Once they make an entrance they must not be pulled off, as it will sever the body from the head, and this is a poison to be avoided. The usual way is to place a lighted cigar or ember near their bodies and the heat causes them to withdraw.

These are not diseases in themselves, but the after effects often prove very difficult to treat successfully.

CORRESPONDENCE.

LETTER FROM CHIHUAHUA.—Continued.

Pueblo, Colorado, May 21, 1883.

Editor Kansas City Review of Science and Industry:

After a very interesting and pleasant visit of thirty-six hours, at Chihuahua, we commenced the return trip. Our first halt was made at Albuquerque, New Mexico, where we found many old friends from Kansas and Missouri awaiting our arrival. Omitting all notice of the warm welcome and hospitable attentions received from all sides, we will devote a few lines to mining and industrial matters in Bernalillo County, of which Albuquerque is now the county-seat. Availing ourself, as before, of material furnished ready to hand, we extract from the Report of Commissioner Chas. S. Howe to the Board of Immigration.

"History informs us that soon after the conquest of Old Mexico, the Spaniards pushed up into this region, conquered it and worked on an extensive scale its mines and placers. Ruins of old cities and towns, with their churches, turreted and loop-holed for defense, are scattered all over the country. Many of them are in mountainous regions where the only industry possible was mining. They could not have been built for defense, because the cities are large and some of them must have contained thousands of people. Numerous ruins of smelters are also found, giving indisputable evidence that mines were once worked on a large scale. Two hundred years ago the Indians, who had been enslaved and forced to work these mines, broke out in rebellion and drove the Spaniards from the country. So intense was their hatred toward those places in which they had been forced to labor, that they filled up every old mine so that no traces could be found of them. A number of years after the Spaniards were allowed to return to the country, but only on condition that the mines should never be opened or worked. This condition seems to have been faithfully kept, and for many years mining was wholly abandoned in the Territory. During the early part of this century we hear of some of these old mines being opened and new ones being discovered, but they were never worked to any great extent. The Indians were hostile, transportation was expensive, and the methods of working ore very crude. It is only within a short period that the mines of New Mexico have begun to attract attention.

Bernalillo County contains some of the most valuable of these old Spanish mines. Several districts have already been opened and work enough done to prove their richness. The greatest variety of minerals abound within the limits of the county. Gold, silver, copper, lead, iron, coal, and lime are found in large

quantities. Granite and sandstone for building purposes are found in numerous places. Immense masses of crystallized gypsum are found in the southern part of the county. The value of this mineral as a fertilizer and for use in the arts is too well known to need explanation.

On the Rio Puerco, about twenty miles from Albuquerque, several veins of coal have been opened which vary from four to eight feet in width. In Tijeras Cañon one vein is nine feet thick and very pure. Other veins are known to exist in these and other localities, but they have never been opened. There has been no demand for coal here until within a short time and consequently none has been taken out.

Hell Cañon is situated twenty miles east from Albuquerque, on the west side of the Sandia Mountains. This mining district was discovered in the summer of 1879. The ore is decomposed quartz carrying free gold, some silver and copper. The Manzanita is a lode of gold-bearing quartz from fifteen to twenty feet wide. Already a shaft fifty feet deep has been sunk, and a tunnel thirty feet in length dug. The ore runs from $12 to $20 to the ton. One of the best known mines in the camp is the Star, owned by Messrs. Strahan, Thomas and others. It was discovered in August, 1879, and from the first gave proof of great richness. It consists of a free milling quartz ore, and the vein is fully eight feet wide. Assays from this mine have shown from $128 to $164 to the ton. One of the earliest discovered lodes was the Milagros. This was the first to call the attention of miners to Hell Cañon, and it has since fully sustained its reputation. Three miles from the cañon is the Golden Chariot lode, a true fissure vein, with well defined walls. North of the cañon are several galena veins found in a granite formation. One of these, the Indiana, assayed one hundred and seventy ounces silver on the surface. It is not claimed for this district that the ore is extremely rich, but that there is an immense quantity of it, and it is easily worked and milled. Water enough to run several mills can be obtained up the cañon, and the sides of the mountains are well wooded.

Tijeras Cañon cuts its way through the center of the Sandia Mountains, and has long been the principal route from the Rio Grande eastward. It lies only twelve miles from the river and is connected with it by a fine, hard road. The ores are copper, lead and silver. Galena has also been found, some of it rich in silver. This is one of the districts which has just been discovered, but which will soon command attention.

Nacimiento is an organized mining district with a recorder's office. For years the Mexicans and Indians have brought very rich specimens of copper ore from the Jemez and Nacimiento Mountains. It was known that there was a rich body of mineral there somewhere, but no systematic effort was made to discover it until 1880. A fine property was found on the west side of the Nacimiento Mountains. The copper occurs as copper glance and gray copper in the ledges of sandstone. The white and red sandstone runs parallel with the mountain side, and for a distance of ten miles, shows traces of copper. In some places the copper occurs as fossils, mostly of trees, but in others it is in immense lodes of

conglomerate. A small amount of silver is found with the copper on the surface, and seems to increase with the depth. The Nacimiento Company now own over a dozen claims, on all of which large deposits are found. On the Eureka a tunnel one hundred feet long has been dug. At a distance of fifty feet from the surface a large vein of conglomerate, twelve feet wide, averaging twenty-five per cent copper, was struck. From that point the tunnel has followed the vein along the dip. This vein can be easily traced for over five hundred feet along the surface, and the indications are that it runs along near the surface for the distance of a mile. The Copper Queen shows a smaller vein, but is much richer. It runs over fifty per cent, and parts of it as high as sixty per cent. In all of these mines there is an abundance of ore that will run forty per cent copper. During the last few months, other prospectors have gone into camp, and over a hundred claims have been staked out. Large veins of fine bituminous coal are found within a short distance of the mines, and wood and water are close at hand. The Nacimiento Company expect soon to have a smelter in operation and be ready to ship bullion by next fall.

The mountains seem to be full of rich veins which only wait the labor of the prospector and miner to be discovered and developed. For the miner and capitalist there can be no better section of country than this.

The next stop was at Trinidad, Colorado, where, as at all previously visited places, we were warmly welcomed. Aside from the generous hospitalities of the citizens, the chief points of attraction are the waterworks and the manufactories, both of which depend largely for their efficiency upon the vast coal supply of the vicinity. This is indeed astonishing, the vein at Engle being full fourteen feet in thickness and yielding thirty cars daily of most excellent quality. We were furnished with the following items by a reliable gentleman, showing the mineral wealth of the region tributary to Trinidad:

There are three workable veins or beds of coal, each from six to fifteen feet in thickness and embracing an area of 1000 square miles. An eight foot vein of sixty per cent iron ore, covering an area of 200 square miles. Bands of six to thirty inches of forty-six per cent iron ore, and aggregating twenty feet in thickness over an area of 800 square miles. Twelve feet in thickness of excellent fire-clay, and two feet of porcelain-clay of an area of 1100 square miles. Thirty feet of building sand stone, superior in weight-supporting quality, cleanliness and beauty, to the celebrated Berea stone of Ohio, over an area of 1200 square miles. Twelve feet of three different grades of fineness of grindstone grit, covering 1000 square miles. A hundred square miles of sandstone of great purity and fineness, conveniently suited for the manufacture of French-plate and other fancy varieties of glass. A two by six-foot vein of seventy-five per cent graphite, thirty miles long, besides terra cotta clays, ochres, limestone, cement rock, and gypsum of superior quality and in large quantities, besides other ores and clays of lesser value.

The coals, irons, fire and porcelain-clays, building and gritstones, consist of different strata over the same area, being of greater or smaller extent according to

their position, the higher ones being diminished in extent by erosion and the lower maintaining more completely the area which nature assigned them.

The coal-veins lie horizontal and are remarkably even and regular, not more than twenty inches of irregularity as yet having been discovered, and that a simple wave. The roof of the vein is of sandstone so firm in structure that no timbering is required in the entries. Although timbering has been deemed unnecessary, but very few fatal accidents have occurred in this vicinity. The vein upon which most development has been made is the middle one, which is the largest. The others, however, have been sufficiently opened to verify the fact that they are as pure and valuable as the middle vein. A remarkable feature about this region is that while the two upper coal veins face the south the lower one faces the west.

The veins or beds, being horizontal, are opened by driving in at convenient points where the coal has been worn away in ravines: no shafting or hoisting is necessary. The mines are perfectly dry—consequently there is no damp or foul air so common in other localities.

The coal from the middle and upper beds has superior coking qualities, making coke which is chemically superior to that of Pittsburg, and equal to the Connellsville article, and practically superior to the latter, being firmer and requiring a greater weight to crush it—an important and very desirable feature when heavy ores are to be smelted. It is also unexcelled for the production of illuminating gas. The coal from the lower vein is non-coking, but is superior for domestic purposes and for use in steam-engines, a non-coking coal being more convenient for those purposes.

The mines now open and being worked are as follows:

The Colorado Coal and Iron Company, Engleville, some two and a half miles east of Trinidad. Its output averages 1000 tons per day.

The Trinidad Coal and Coking Company, Starkville, three miles south of Trinidad. Output 800 tons per day.

The Consolidated Stone and Coal Company, two miles south of Trinidad. Output about 100 tons per day.

The Detmer & Ostenburg, about three miles north of Trinidad. Output about 30 tons per day.

The Colorado Coal and Iron Company has 250 ovens in blast at El Moro, four and a half miles from Trinidad, and the Trinidad Coal and Coking Company 50 ovens at Starkville, and are unable to supply more than half the demand for Trinidad coke.

This most memorable tour was concluded by a visit, over the Denver & Rio Grande R. R., to the Royal Gorge or Grand Cañon of the Arkansas, whose grand and picturesque scenery has been described so often that we will, for the sake of brevity, omit it here.

Many incidents and points of interest along the line of this 3,300 mile trip have necessarily been overlooked in this hasty letter, but we shall try to do them justice in future descriptions.

In conclusion, it is eminently proper to say that everything possible was done

for the convenience, comfort, and information of the excursionists, by the President of the Association and the officers of the Atchison, Topeka & Santa Fe R. R. and the Mexican Central R. R. and the Denver & Rio Grande, R. R., as well as by the people of the towns where we stopped, and that the whole affair brings up naught but the most pleasurable recollections. C.

THE ATCHAFALAYA.

HELENA, ARKANSAS, June 7, 1883.

EDITOR GLOBE-DEDOCRAT.—Your correspondent interviewed again to-day Col. J. B. Miles, the great river prophet of Helena, upon the much-discussed question of the Atchafalaya in connection with the published remarks of R. S. Elliott, a river engineer of some reputation. Col. Miles said:

"I am glad to find that Mr. Elliott agrees with me in my theory, but he says that I turn to prophecy with sad results, and then goes on to quote Major Stickney, of the Mississippi River Commission, to show the fallacy of my prophecies. This is but another illustration as to how differently people receive the same statement of facts. Mr. Elliott considers Major Stickney's report as fatal to my prophecy or theory. Now, there is nothing in this report at all in conflict with my notions. I already knew the depth of water in the bay, and all the other facts set forth. If Mr. Elliott will study this report he will find that Major S. referred to the present condition of affairs and the present amount of water flowing down the Atchafalaya, which is estimated by Major Harod at 400,000 cubic feet per second, while at the same time he estimates the amount passing down the Mississippi at 1,600,000 cubic feet.

"Now suppose all this water, 200,000 cubic feet per second, was confined to the Atchafalaya at its head, don't you think it would root its way to the Gulf and make a channel for my big steamers at last? I venture to prophesy that it would. When Major Stickney mentions jetties he shows exactly what is needed to make a channel, simply to concentrate the water already there, or to increase the amount. I therefore still make the same assertion or prophecy, that the water flowing down the Atchafalaya will root a channel of the same depth as at the head, or Simmsport, all the way to the deep water of the Gulf. Mr. Elliott thinks the water will spread out over the low lands and the channel be lost. He does not seem to know that the Mississippi has a way of its own of answering this objection, namely by filling up these low lands to the height of its overflow, making natural banks and assisting my rooting operation. If Mr. Elliott will get the engineer's report he will find that about all the slope from the Mississippi to the Gulf is in the first eighty miles, at which point the high water mark is only eight feet above the Gulf level, while the high water mark at the Mississippi is fifty-two feet above the Gulf. This gives a slope of nearly eight inches to the mile for the first eighty miles, and less than one inch from the head of Grand Lake to the Gulf.

"The Atchafalaya overflows its banks almost or quite from its head to the Old River. The consequence of this overflow is shown in the report that the bayou is lined with deserted sugar plantations, the houses and everything else being half covered with sediment. Any one will understand the effect of of this filling, viz.: to raise the banks and as the banks are raised it forces that much more water further down the channel or bed of the stream. I prophesy that this filling will go on until the banks are built up within a few inches of high water mark, and confine all the water to a channel or nearly uniform width from Red River to the Gulf.

"The present width of the Atchafalaya is about 1,000 feet at the head and about 130 feet deep. For the entire Mississippi to go down that way would require a width of about 3,000 feet. The fill in the low lands will increase as the head water increases. This fill will continue until the channel is cut out into the Gulf when the high water mark along the new channel from Red River to the Gulf will be lowered, and the lands along the bank will be high above overflow. Then, indeed, will southern Louisiana become the garden spot of the world. With the entire river turned down the Atchafalaya the difference between high and low water at Red River would not exceed twenty feet, and the lands would be about fifteen feet above overflow, while along the old channel by New Orleans the water would be on a level with the Gulf, affected only by the tide, and would be salt water. It would be a lake, 320 miles long, half a mile wide, and the water never above the present low water mark.

"But what is to become of New Orleans? I answer that it must go. The shipping port should be at the head of steamship navigation. This, in my opinion, would be at the mouth of Red River, or above. In my opinion, the fate of New Orleans is sealed.

"Now, Mr. Elliott admits my statement in regard to the filling up of the bed of the Mississippi below Red River. If it has filled so that a rise of three feet below high water at Red River makes the highest water known at New Orleans, how do you expect to wash out that channel again? It could only be done by closing Atchafalaya, which is now estimated to carry off one-fifth the water that previously went down the Mississippi. It would be necessary to raise the levees high enough to hold this extra water, or it would not scour out. This would require levees below Red River ten, if not fifteen, feet higher than they are now, and who proposes to build any such levees? The proposition of the River Commission to divorce Red River and Atchafalaya from the Mississippi would be worse still, as the filling of the bed below Red River would be much more rapid even than now, and the levees would have to be raised higher eventually than if the attempt was made to close the Atchafalaya.

ANTHROPOLOGY.

THE MAN OF THE FUTURE.

E. KAY ROBINSON.

The Man of the Future—that mysterious being who will look back across a dim gulf of time upon imperfect humanity of the nineteenth century with just such kindly and half incredulous scorn as we now condescend to bestow upon our own club-wielding, ape-like ancestor—will be a toothless, hairless, slow-limbed animal, incapable of extended locomotion. His feet will have no division between the toes. He will be very averse to fighting, and will maintain his position in the foremost files of time to come solely upon the strength of one or two peculiar convolutions in his brain. This may seem to be a poor prophecy; but it differs from most prophecies in being a mere logical deduction from accomplished facts.

Only in very recent times has the extent of our scientific knowledge been sufficient to justify even the genius of a Darwin in attempting to evolve a rational scheme of the past; and it is not suprising, therefore, that the idea of using that knowledge like a two-edged knife to cut forward into the future, as well as backward into the past, should not have occurred to our men of science as yet. A little inspection of the weapon, however, will show that it is equally handy for either purpose: for dissecting the coiled-up thread of the destiny of species, as for cutting through the tangled web of their origin. From the same plentiful materials of the present it should not be more difficult to write an account of the descendants than of the descent of Man. The task, however, in its entirety, demands another Darwin. Meantime others less gifted may venture to sketch in a rough outline of the Man of the Future with his bald scalp and empty gums.

Of course it may be objected at the outset that Darwin's theory of the Origin of Species stands itself still in need of scientific demonstration. To those to whom such a contention commends itself, no reply shorter than three volumes is possible, and to them these few paragraphs are not addressed. I may take it therefore for granted that, although the logical buttresses of some of Darwin's theories are plainly built of materials too flimsy to support the weight placed upon them and some few are completely undermined and useless, nevertheless no man of thought can honestly deny that his genealogy of the human race is in the main reconcilable with fact, with science, and with religion in the highest acceptation of that term. Nor, after a moment's consideration of the arguments hereafter to be adduced, should any honest thinker find difficulty in going further and admitting with me that Nature, like Janus of old, has two faces, one looking

forward as significantly into the Future, as the other backward into the Past. If by minute inspection of the recent footprints of changes that are now passing over the world, one philosopher was guided to proclaim whence those changes started, surely another philosopher of equal powers could tell us, at least as clearly, whither they are going? For it must not be imagined that Darwin's self-appointed mission of tracing Nature backward to its source was in any especial way facilitated by the scanty relics of the actual past that geology has unearthed. As a matter of fact the strongest arguments *against* his theories of gradual evolution, such as the sudden appearance of distinct species in particular strata, and many other similar difficulties, have been furnished by geologists. His Origin of Species is written entirely in the living characters of the present. Old types are indeed introduced here and there by way of comment and illustration, but if the Dinotherium and the Mastodon were still slumbering the sleep of the extinct Unknown, in company with the undiscovered ape-like animal, the "Missing Link" of popular imagination, the descent of man would have been no more difficult to trace. It was from lions and peacocks, toads and insects—various renderings in aberrant modern types of the same old story of evolution and development—that Darwin compiled the volumes that have revolutionized modern philosophy and modes of thought. It could not have been otherwise. The organic remains of geology would have been as useless to guide him through the free realms of thought he traversed, as the name of his own street corner to teach him the geography of Europe. The interval that has elapsed since woolly elephants browsed along the site of the Strand, mysteriously long as it appears to us, would occupy merely the last page of the latest volume of the interminable History of Man. It is indeed a fragment of the original, but so mutilated and imperfect a fragment as to be incomparably inferior to the innumerable translations and modifications of the text printed on loose sheets and scattered over the globe wherever an animal or fish is found, wherever a bird or insect flies. By collecting and deciphering these isolated sentences, Darwin has reproduced, in due proportion, but vague outline, the whole of the mighty work; and where the original geological fragment tallied with his translation he said so, and where it did not tally, he said so. But he was in no way indebted for his knowledge of the past to a study of the past. From the present attitude of Nature he inferred whence it had come, and we can guess whither it is going.

It will be remembered that Darwin's theory of the evolution of different species receives strong confirmation from the parallel changes which each individual of those species undergoes in growth from the embryo to maturity. The human embryo, for instance, has a hairy skin; a brain with convolutions similar to those of an ape; a great toe projecting like a thumb from the side of the foot, a single pulsating vessel instead of a heart, and a tail longer than its legs. These characteristics disappear long before birth; and thus each human individual before coming into the world exemplifies in his own person the development of his species from some lower animal—lower even than the ape—and furnishes solid collateral evidence of the truth of the theory founded by Darwin upon a compari-

son of the affinities and differences of allied species as they exist at present. But just as each individual, before becoming subject by birth to the influence of surrounding circumstances, reproduces the character which his species wore before those surrounding circumstances had produced any effect, so each individual, after having passed beyond maturity under the influence of surrounding circumstances, foreshadows the character which his species will wear when those circumstances have produced their full effect. If, then, by following Darwin's method of comparing the affinities and differences of existing species, a new theory of the evolution of the future is built up, and it is then found that each individual during his passage from maturity to old age undergoes the same changes that are predicted for the species, there would be good *prima facie* evidence in favor of the correctness of the theory; and this evidence is not wanting.

There is, of course, this difference between a retrospective and a prospective theory of evolution: that the latter can only be carried forward for a short way, only so far in fact as the present incompleted stage of the journey reaches. After that we cannot even conjecture in which direction the next new departure may be taken. In looking back upon the lines of descent which different extant species have followed, we see a number of converging lines, and can place our finger upon the point of intersection and say, "There was the common parent of all these species." In looking forward, on the other hand, we can only see the divergence of the lines, and have no fixed points in the landscape to guide us as to their ulterior destination. Hence in pointing out the path that evolution of the future *must* follow, we can only speak with assurance of a very little distance, and with doubt of a few steps more. Unforeseen circumstances and oblique influences cannot fail to arise to turn each species aside from the course it is now following. With this explanation I may restate the proposition that the man of the future will be a toothless, hairless animal, incapable of extended locomotion. His feet will have no divisions between the toes. He will be very averse to fighting, and will maintain his position in the foremost files of time to come, solely upon the strength of a few peculiar convolutions in his brain. Compared with the stately broad-winged possessor of "vril," this picture of the coming race is not flattering, but it is at least more probable. More details might easily be added, but those which have been enumerated are sufficient for the purpose, and are so obviously the inevitable results of changes already partially accomplished, that few words will be necessary to support them.

The different parts of the human frame as it exists now have been evolved or modified by the action of the two great principles that have always regulated the development of species. Every organ and every ornament that man possesses has been acquired by natural or by sexual selection, and when either of these forces is weakened or removed, or when the necessity for such organs or ornaments is no longer sufficient to counterbalance the loss of the power employed in their production, then they commence at once to disappear. This is the case with human teeth. The early ancestors of man were furnished, as the male gor-

illa is to-day, with magnificent grinding teeth for crushing hard fruits, and huge canines for fighting with other males for the possession of the females. A trace of this remains in the more powerful dentition of savage races, who stand a short distance nearer to our common ape-like ancestor. Civilized human-beings, on the other hand, have absolutely no use for canine teeth, which are therefore found to be small in proportion to the civilization of their possessors; and for the rest of the teeth they are eminently unsuited for the work they have to perform. This is sufficiently plain from their early decay and the artificial means which have to be employed in order to retain them even to maturity. The so-called "wisdom teeth" are even now being lost. They are the last to appear, and the first to go, and even while we have them are unemployed. The rest will follow them probably two at a time, and their places will be supplied no doubt by a hardening of the gums, which cannot fail to be imcomparably more convenient and suitable to the viands of civilized life.

Long hair, beard, mustache and whiskers are all sexual ornaments acquired by man to charm and allure the opposite sex, just as the canine teeth were acquired to fight for a similar purpose. But neither is sexual selection so powerful now, nor are these hairy ornaments so important as they used to be. Marriage is no longer settled by the strength of magnificent hairiness of the suitor. Wealth will cover the bald head; intellect is more valued than whiskers, and the length of a rent roll counterbalances the shortness of a beard. A woman too, who has but a scanty supply of that ancient "pride of a woman"—long hair, can eke it out by fraud and art, nor need she go unwedded on that account. Neither men nor women therefore who happen to be ill-furnished with hair are now as formerly, handicapped in the race of life and unlikely to leave children to inherit their defects. On the other hand, they gain a distinct advantage at the outset, inasmuch as no vital force is in their case wasted in the production of useless ornaments. There is, moreover, a mysterious law of correlation of growth between the hair and the teeth. Throughout the animal world strong and luxuriant hair is accompanied by regular and durable teeth; and a hairless breed of dogs exists which is equally conspicuous for the absence of its teeth. Hence, it might have been expected that civilization would affect the hair as much as the teeth, and infallibly tend to suppress all hirsute adornments, as not being sufficiently necessary to the welfare of the individual to repay the cost of their production. Experience confirms this view; for as the teeth are small, soon lost, and two of them, at least, capricious in appearance, so bald heads in the prime of life, smooth cheeks and beardless chins among men and women conspicuous for the absence of natural locks, are common in civilized countries; while savage tribes, who have more lately left, or still remain in, that state of society in which individual strength and personal ornament are demanded by the principles of natural and sexual selection, have stronger teeth and retain more of their original wealth of hair.

With respect to his locomotive limbs civilized man has lost some faculties and is losing others. The prehensile power of the great toe, inherited from our

ape-like ancestor, and still obvious in the human embryo, is retained in part by savage races; but of necessity lost by those human beings who habitually inclose their feet in the boots and shoes of civilized life. Indeed, the separation of the five toes under such circumstances is no longer necessary, and will not permanently survive. Already the percentage of persons who have two or more of their toes united throughout their length is surprisingly large.

In that particular form of endurance, again, which enables a man to travel long distances on foot, the savage is, as was to be expected, immensely superior to his civilized brother. And increased facilities of artificial locomotion, by rendering the use by the latter of his lower limbs more and more unnecessary, will reduce them in time to a comparatively rudimentary condition. Finally, the readiness of our ancestors, and of our savage contemporaries, to fight with one another is no longer profitable, but absolutely pernicious, in the struggle for civilized existence. There is no necessity nowadays for frequent personal combats and struggles of life and death. On the contrary, a man who is violent and pugnacious will, as a general rule, be more often imprisoned or slain in the prime of life than his more pacific neighbors, and will therefore leave fewer children to inherit his fighting spirit. Thus the constant process of elimination of combative men will continue, without any compensating advantage in the struggle for existence, arising as heretofore from success as a warrior. The man of the future, therefore, will not only be toothless, bald-headed, and incapable of extended locomotion with his imperfectly developed feet, but he will also be particularly averse to engaging in personal conflict—a lover of peace at any price.

Now it would, as was remarked above, furnished a strong confimation to this theory if it were found that each individual of the human species, during his passage from maturity to old age, presented in his own person any of these several changes predicted for the species. That he does so in a remarkable degree cannot be denied. Taking up our position in imagination at that point which is called the prime of life; as representing the highest point of development attained by man in the present, and looking back, we can in his person trace the career of his species throught the fiery age of semi-civilized youthful nations, the period of unbridled love and fearless war, and through the uncivilized period of boyhood, with all the restlessness, impudence, and love of discordant noises that distinguish savages, to the mere embryo, with its hairy skin, separate great toe, and long tail like a monkey, and with the single pulsating vessel which serves for a heart to animals far lower than the apes. Turning round and looking forward, on the other hand, we can see the latter period of life when man has lost two of his teeth and much of his love of locomotion; and the final period, when he has become a toothless, bald headed, stiff-limbed animal, incapable of extended locomotion, nervous and timid—an old man in fact. If it should enter into the head of any future novelist to write another circumstantial account of "The Coming Race," it is to be hoped that he will make use of the above materials, which, if less picturesque than "vril" and wings, are, as I have said before, at least more consonant with nature.—*The Nineteenth Century.*

ORIGIN OF THE WHITE MAN.

E. B. TYLOR.

There may be remains of Stone Age whites, but there are no certain remains of white savages of a low order. We may well doubt if there ever were any white savages; it is more likely that the white men were developed late in the race-history of the world from ancestors already far on in civilization; in fact, that this civilization, with its improved supply of food, its better housing and clothing, its higher intellectuality, was one main factor in the development of the white type. Here, however, it must be remembered that there is not a white race in the sense in which there is a Carib race or an Andaman race. It includes several race-types, and even the same languages, such as English or German, may be spoken by men as blonde as Danes or as dark as Sicilians. The fair-haired Scandinavian type has something of the definiteness of a true race; but as one travels south there appear, not well-defined sub-races, but darkening gradations of bewildering complexity. The most reasonable attempt to solve this intricate problem is Prof. Huxley's view that the white race is made up of fair whites of the Northern or Scandinavian type and dark whites, who are the result of ages of mixture between the fair whites and the darker nations, though it is perhaps hardly prudent to limit these dark ancestors to one variety, as he does.

If now we can not trace the white man down to the low level of primitive savagery, neither can we assign to him the great upward movement by which the barbarian passed into civilization. It is not to the Aryan of Persia nor to the Semitic of Syria that the art of writing belongs which brought on the new era of culture. The Egyptian, whose hieroglyphics may be traced, passing from picture into alphabet, had his race allies in people of North Africa, especially the Berbers of the north coast—people whom no elasticity of ethnological system would bring into the white race. Of the race-type of the old Babylonians, who shaped likewise rude pictures into wedge-phonetic signs, we know but little as yet; at any rate, their speech was not Aryan, and the comparisons of Lenormant and Sayce have given some ground for connecting it with the Turanian language, belonging to a group of nations of whom one, the Chinese, had in remote antiquity worked out a civilization of which the development of an imperfect phonetic-writing formed part. If the great middle move in culture was made, not by any branch of the white race, but by races now represented by the Egyptian and the Chinese, it is not less clear that these nations came to the limit of their developing power. The white races had in remote antiquity risen high in barbaric culture when their contact with the darker nations who invented writing opened to them new intellectual paths. The Greeks found in the ancient Egyptian theology the gods of the four elements, but they transferred this thought from theology to philosophy

and developed from it the theory of elements and atoms, which is the basis of modern chemistry. They found the Babylonians building terraced temples to the seven planets in the order of their periods, and this conception again they transferred from religion to science, founding on it the doctrine of planet spheres which grew into mathematical astronomy. It may moderate our somewhat overweening estimate of our powers to remember that the white races cannot claim to be the original creators of literature and science, but from remote antiquity they began to show the combined power of acquiring and developing culture which has made them dominant among mankind.—*Nature.*

ENGINEERING.

A GLANCE AT THE HISTORY OF RAILROADS IN MISSOURI.

HON. GEORGE C. PRATT.

The year 1830 is called the railroad era. The adhesion of the driving-wheel of the locomotive to the iron rail, necessary to give the requisite tractive force, had then been demonstrated; the rapid generation of steam by means of the multitubular boiler, had proved that high speed was attainable, and the track had been made sufficiently substantial to bear the strain of rapidly moving heavy machinery. During that year the Liverpool & Manchester road was opened to the use of locomotive power; Peter Cooper's trial engine, the Tom Thumb, appeared on the Baltimore & Ohio, and the West Point foundry of New York turned out a serviceable engine called The Best Friend of Charleston, for the South Carolina road. During the same year, ground was broken in Missouri for a tram-road from New Franklin, in Howard County, to the Missouri River.

On the 20th of April, 1836, a railroad convention met in St. Louis, at which a plan was agreed upon for three railroads, radiating from that city northwest, west, and southwest; a committee was appointed to memorialize Congress for a grant of public land to aid in their construction, and it was recommended that the faith and credit of the State be pledged to the amount of $10,000,000, for the same purpose. The Hon. John B. Clark, Sr., of Howard County, and the Hon. James S. Rollins, of Columbia, were members of that convention. Rollins offered the resolution in regard to the land grant, and was made chairman of the committee to draw up the petition to Congress. In the autumn of the same year, the Louisiana & Columbia Railroad line was surveyed by Lieut. Guion, of the U. S. Army, assisted by an engineer named Webster. On the completion of this survey to Columbia, the engineering party were treated to a supper and ball given at the house of Gen. Richard Gentry, who was killed the very next year,

while in command of the Missouri volunteers, at the battle of Okechobee in Florida. So far as is known to the writer this is the first instrumental survey of a railroad line ever made in the State. A copy of Guion's report may be found in the library of Major Rollins, in a bound volume of old pamphlets. It is possible that the survey of the Marion City & Missouri Railroad may have been anterior to this, but no documentary proof thereof has been discovered. (See Laws of Missouri, 1836–39, page 253).

The General Assembly elected that year chartered sixteen railroad companies, and the one elected in 1838, created a "Board of Internal Improvements," consisting of five members, and the office of State Engineer, under whose direction the Meramec Osage, Grand, and Salt Rivers were surveyed for slack water navigation, and a line was run for a railroad from St. Louis to the Iron Mountain. This last survey was made by Major Morel, the State Engineer, in 1839, and has been erroneously claimed to have been the first railroad survey made in the State. (See Report of Thomas Allen, President St. Louis & Iron Mountain Railroad for 1874).

It was not, however, until July 4, 1851, that the work of railroad construction actually commenced in Missouri. On that day ground was broken on the Pacific Railroad in St. Louis, Luther M. Kennett, Mayor of the city, casting the first shovel of earth. Austin A. King, Governor of the State, had been invited to perform that service, but failed to be present. Within the next four years the North Missouri, the Iron Mountain and the Hannibal & St. Joseph Companies also commenced work During the fifteen years following the St. Louis convention there had been a lively discussion of the subject of Internal Improvements, and particularly in the canvass preceding the election of 1848. Both the last message of the retiring governor, at the close of that year, and the inaugural address of the incoming governor made special reference to it. Our position was this: We wanted railroads, and did not have the money wherewith to build them. Foreign capital could be had only on the credit of the State and land mortgages. The only course to be pursued therefore, in order to obtain the thing desired, was the one pointed out by the St. Louis convention in 1836, and we adopted that course. The Pacific Railroad Company had been organized in March, 1850, with Thomas Allen as President. Individual citizens, the city and County of St. Louis, and counties along the line of the road manifested a willingness to subscribe liberally to the capital stock of the company, and in February, 1851, the State loaned its credit to that company to the amount of $2,000,000, and to the Hannibal & St. Joseph Company to the amount of $1,500,000. This first grant of State aid to railroads was soon followed by others, and during the next six years, our legislatures authorized loans to seven different companies, amounting to $24,950,000, of which $23,701,000 in State bonds bearing six per cent interest, was legally delivered to and used by the companies; to the Pacific Company $7,000,000, the Southwestern branch $4,500,000, the North Missouri $4,350,000, the Iron Mountain $3,501,000, the Hannibal & St. Joseph $3,000,000, the Platte Country $700,000, and the Cairo & Fulton $650,000. One bill passed in December, 1855,

appropriated $11,000,000, in one lump, which bill being vetoed by Governor Price, the legislators took the total responsibility on themselves and passed the bill over his head.

In making these loans of State credit to railroad companies, care was taken to provide such means as were thought to be amply sufficient to secure the State against any possible loss. Such were the provisions under which State bonds were delivered to the companies, only to the amount of their own capital derived from other sources, previously expended; the creation of fund commissioners to look after the sale of the State bonds and the application of their proceeds; the appointment of a "Board of Public Works," consisting of three members, to supervise the operations of the companies in the construction of their roads; and especially the creation of statutory liens upon the roads in favor of the State. The obligations under these liens were peculiar. The State did not loan money to the companies, except some small amounts which were repaid, nor bind them to repay her any money. She loaned them her bonds, on which they could raise money, and the obligation on their part was to return these bonds to the State, and while they were outstanding, to pay to the holders of them, the interest as it accrued, and the principal at maturity. In default of either of these payments, the governor might sell their roads and apply the proceeds to this purpose. The Missouri Pacific Company had borrowed $7,000,000 of these bonds, sold them and used the proceeds in building her road. Being afterward desirous of procuring a release of the State's lien upon her property she bought up five millions of the bonds, turned them over to the State, and obtained an entire release from the whole obligation, by act of the legislature; the consideration for the loss of the two millions being (we presume) considered by the body to be good and sufficient. In the case of the Hannibal & St. Joseph Company, it was provided by an act approved February 20, 1865, ten years after the last loan had been made to this company, and six years after its road had been completed from Hannibal to St. Joseph, that the cancellation of the State's lien upon its property might be effected by the payment to the State of money instead of bonds, provided the amount paid were sufficient to indemnify the State for "All liabilities incurred by reason of having issued her bonds and *loaned the same* to said company."

Under this policy adopted by the State, and with the aid of liberal subscriptions to the capital stock of the companies by counties, municipalities and individuals, supplemented by grants of lands from Congress, we inaugurated and prosecuted railroad building until interrupted by the civil war in 1861, ten years after we had commenced the work of construction. At this time we had 800 miles in operation, but only one of the roads had been completed through to its projected terminal point. After the war, it was found that the credit of railroad property in Missouri had so appreciated that money could be raised by mortgages upon such property without difficulty, and even on mortgages upon projected lines of road to which liberal local subscriptions could be had. Our companies were therefore anxious to extinguish the State's lien upon their lines, in order

that they might mortgage them for larger sums to other parties, and, by means of sales and statutory releases, these liens were cancelled on all the unfinished roads, for the alleged purpose of expediting their completion. In connection with these statutory releases, a very fortunate piece of legislation occurred. I refer to the so-called exemption acts of March, 1868, by the effect of which seven of the principal companies became bound by *contract* with the State, witnessed by their certificates filed in the office of Secretary of the State, to be subject, after March, 1878, to all laws fixing rates, then in force or thereafter to be enacted. This measure saved us from that which cost other States long years of litigation. At the same time new lines of road were being projected in all parts of the State, to which local subscriptions, in enormous amounts, were every where made, until a check was placed upon this reckless expenditure by the financial crisis of 1873, which suspended railroad building for a time and gave us an opportunity to review the situation. We then had 2,850 miles of road completed, and 700 miles more of graded but unfinished lines, very little of which last has been or ever will be utilized.

The amount of means furnished by us and which actually went into the construction of these lines did not vary much from $50,000,000. This includes State aid and subscriptions of counties, cities, townships and individual citizens of the State. But in closing up the liens upon the roads we had recovered back into the State treasury five millions from the Pacific Company, about half a million more from the other companies, and if we add to that the three millions since received from the Hannibal & St. Joseph Company, and about a half million more received by counties and individuals from the sale of railroad stocks included in these original subscriptions, it makes the total receipts nine millions. But this nine millions recovered back, falls very far short of the amount of interest that had been paid by the State previous to 1873, in consequence of the failure of the companies to meet it, so that if the account could have been closed out with cash at that time on the same basis upon which this estimate is made, our 2,850 miles of road would have cost us considerably more than the original $50,000,000; probably not less than $60,000,000, which is over $21,000 a mile. Of course this amount has since increased and will continue to increase by the amount of interest paid, until the last railroad debt is cancelled. At the same time we had allowed the ownership of the roads to pass into other hands; but we wasted no regrets on that, as we had undertaken their construction, not for the purpose of holding them as property, but because we wanted the *use* of them.

The enormous shrinkage in values, consequent upon the financial crisis of 1873, whereby the selling price, not only of the products of our labor, but in some instances, that of our real property also, fell to one-third of what it had been during the previous decade, coming upon us at a time when we were oppressed by an enormous load of debt, both public and private, created universal consternation, distress and bankruptcy. By bitter experience we learned that however much a debtor's paying capacity may shrink in hard times, his debts do not shrink. In this case they were actually augmented by unskillful management of

finance by the Federal Government. Moreover, neither taxes nor transportation charges were reduced, nor was it clearly apparent that either of them could be reduced without clogging the wheels of local government or of commerce. In this dire emergency, our people exhibited a degree of wisdom and of nerve rarely witnessed in any community. We ordered the assembling of a constitutional convention, we passed a legislative enactment limiting railroad rates on our chief articles of export, such as grain and live stock, on some imports of prime importance, such as salt, lumber and agricultural implements, and on passengers; and we created a Board of Railroad Commissioners to exercise a general supervision over the subject of railroad transportation. These three measures, viewed in the transcendently brilliant light of their successful results, exhibit an extraordinary capacity for self-government unsurpassed by any people, and furnish material for one of the brighest pages of history that ever adorned the annals of any commonwealth. The Constitutional Convention boldly struck at the root of the evil of public debts by prohibiting their creation in the future, and of excessive taxation by limiting the rate thereof. On this subject I will quote a few paragraphs from an article written at the request of a gentleman in another State, and published there, four years after the adoption of the constitution framed by that Convention.

"This constitution was framed under circumstances, although not peculiar to Missouri, yet so grave and ominous as to challenge the attention of reflecting minds throughout the commonwealth. The State, the counties, the cities, and towns, had gone recklessly into debt, mainly for the purpose of securing the building of railroads, and more of these had been constructed than the commerce of the State could supply with a paying business. There was a mile of railroad to every 625 inhabitants in the whole State, and in the forty-four counties north and east of the Missouri River, there was a mile of railroad to every 400 people and to every fourteen square miles of territory. According to one of the best authorities it takes 825 inhabitants to the mile to make a railroad earn a living in the United States. In some cases where local subsidies had been granted in amount equal to the total cost of construction, the roads so subsidized were found to be mortgaged for $30,000 a mile. The waste of public treasure had been frightful, and the amount of public debt was appalling. The Federal debt was $50 per capita, the State debt $10 more, the county debts as high as $40 more, amounting, in some counties, to $100 a head on the rural population, while the urban populations carried additional burdens varying from $5 to $60 a head. The lowest possible public debt on any community in the State was therefore $60 per capita, and the average was somewhere between that and $150, while the assessed value of all property based on the high prices of preceding years averaged only $300 per capita. At the same time the selling price of property had depreciated to seventy-five and fifty, and in the case of some products of labor, as low as twenty-five per cent of what it was when these debts were created, whereby the burden of the latter was double or even trebled, and made equal in extreme cases to the average value of property per capita. No free people will long carry such a

burden. Its very enormity of weight suggests the necessity of dropping it at once, to avoid being crushed beneath it.

"It was under these circumstances that the Constitutional Convention assembled in the summer of 1875, and with these facts before it, that the subject of the limitation of legislative power was entered upon. The legislative branch of the government had sanctioned the creation of this insupportable load of debt. Its power had therefore been misused in this respect and should be restrained.

The resulting evils already indicated that repudiation (at least in the mild form of compromise) would, in some instances, be certainly resorted to, and that the consequent reduction of the standard of public morals, carrying with it a depraved sentiment in respect to obligations between man and man in their private capacity, must necessarily follow. These evils must therefore be arrested, and the plan adopted was to cut off their source, prevent a further accumulation of the burdens which had caused them, and thus relieved of the fear of any future increment of burdens, we would be free to grapple with those already existing.

"Therefore, in the constitution prepared by this convention, and afterward adopted by the people, provisions were inserted which effectually prevented the creation, thereafter, of any public debt whatever, except for certain specified purposes; and so limited the rates of taxation for State, county, or municipal purposes, that except for the liquidation of the debts, these rates can never reach one and three fourths per cent on the valuation of city property, nor three fourths of one per cent on country property. To the tax payers of Missouri the adoption of this constitution came like a burst of sunshine at noon to the storm-tossed mariner who had lost his reckoning; or like a touch of firm bottom to the foot of the exhausted swimmer. Four years have elapsed since that event occurred, and results already prove that the State has been thereby rejuvenated, and enabled to commence a new and more vigorous growth."

Since that article was penned, three years more have elapsed, and each year has added cumulative evidence that the new and more vigorous growth then begun has far outstripped the most sanguine anticipations of the writer. In the accomplishment of these results, the two other measures which I have mentioned, have also borne their part, and have contributed more largely than was expected from our imperfect law of rates, and the limited powers conferred upon the railroad commissioners. Viewing the situation from the standpoint of the present, we find our State debt in such condition as promises entire extinction within a few more years, our other public debts very materially reduced, and our private debts except those on railroad property almost entirely liquidated. At the same time our paying capacity has so largely increased that, except in a very few counties, neither public nor private debts are now felt to be a burden. The numerous farm mortgages have mostly been cancelled, and farmers are mainly out of debt. The extension of railroad facilities throughout the state is progressing more rapidly than at any former period, the number of miles having increased to 4,500 at the close of 1882. The total business of all the roads in the State has increased from

upward of $14,000,000, in 1877, to nearly $28,000,000, in 1882. During the same time, the average receipts per mile of road have increased fully fifty per cent, and the receipts per train mile are far in excess of the cost of transportation. Whilst this rapid growth of our railroad mileage has been going on, without any expense to us, and this enormous increase of railroad receipts, and these evidences of railroad profits have been developing, it also appears, that under the operation of our law of rates, which went into effect in March, 1878, and through the labors of the commissioners in enforcing that law, the rates we have paid since that date have been fully twenty-five per cent less than they were before or would have been since, but for the action of the commissioners. This reduction has affected a clear saving to the people of the State, as shown by the late message of his excellency, Governor Crittenden, averaging $5,000,000 a year, and amounting, for the five years during which this law has been in force, to $25,000,000.

These are some of the magnificent results, which we may honestly claim to have been, in great measure, brought about by the cool intrepidity and wise statesmanship exhibited by our people and by our public servants, in adopting the measures which have so certainly and so completely relieved us of our load of debt and delivered us from our perilous position, rendered still more perilous than I have described it, by the fact, that we had been precipitated into the whirlpool of that financial revulsion which bankrupted nearly all of us who had sufficient credit to become borrowers, while yet battling against that blinding storm of overwhelming misfortunes, consequent upon a civil convulsion which annihilated our surplus capital, paralyzed production and disfranchised a majority of our tax-payers. That we have, under such an accumulation of adverse circumstances, achieved a result so entirely successful, may well fill our hearts with gratitude to the Supreme Arbiter of the fortunes of States, with a just and honorable pride in the commanding position which Missouri has nevertheless, already attained, and with exultation at our happy lot in being numbered among her citizens.

In conclusion, let us contemplate for a moment, that crowning glory of Missouri, the splendid financial position occupied by our State government; let us point to it as an example to be imitated by our minor political corporations, and hold it up as a beacon-light to guide our railroad corporations into that restful haven whither our ship of state is gently gliding, immunity from debt. If it be good policy for our State to pay off its debt, and thus relieve us from the interest tax to which we are now subject, it is also good policy for counties, cities and towns to do the same; and the policy is a better one, when applied to business coporations, because, when their only liability is a stock account, of only one class, all the capital invested in them is represented and equally represented in the management; and good management might become the rule, instead of being the exception. To say that this policy will not some day be adopted by railroad companies, is to impugn the business sagacity of the owners of railroad property; and to doubt the possibility of holding these mammoth corporations within the restraints of statute law is to abandon all idea of government by law.

The very fact that human ingenuity has evoked from chaos this gigantic combination of forces, which is now causing the world of trade to tremble beneath its ponderous tread, is itself an assurance that human genius will also teach us how to curb this embodiment of concentrated power, and train it to work quietly in the service of commerce.

JEFFERSON CITY, MO., June 1, 1883.

ASTRONOMY.

TIME OBSERVATIONS.

W. W. ALEXANDER.

The correct measurement of time is not only one of the most important parts of practical astronomy, but it is one of the most direct benefits conferred on mankind by the science; it enters, in fact, so much into every affair of life, that we are apt to forget there was a period when that measurement was all but impossible.

Among the contrivances which were to the ancients what clocks and watches are to us, may be mentioned the clepsydræ, or water clocks, sun-dial, hour-glass, etc. About the year 780, B. C., clepsydræ of the most elaborate construction were common; but while they were in use, the days, both in summer and winter, were divided into twelve hours, from sunrise to sunset, and consequently the hours in winter were shorter than in summer. The clepsydra, therefore, was almost useless, except for measuring intervals of time, unless different ones were employed at different seasons of the year.

The sun-dial also is of great antiquity, being referred to as in use among the Jews 730 B. C. This was a great improvement upon the clepsydra, but at night and in cloudy weather it could not be used of course. To understand the construction of a sun-dial, let us imagine a transparent cylinder having an opaque axis; both axis and cylinder being placed parallel to the axis of the earth. If the cylinder be exposed to the Sun, the shadow of the axis will be thrown on the side of the cylinder away from the Sun, and as the Sun appears to travel round the earth's axis in twenty-four hours, it will equally appear to travel round the axis of the cylinder in the same time, and will cast the shadow of the cylinder's axis on the side of the cylinder as long as it remains above the horizon.

All we have to do, therefore, is to trace on the side of the cylinder twenty-four lines fifteen degrees apart ($15 \times 24 - 360$), taking care to have one line on the north side. When the Sun is south at noon, the shadow of the axis will be thrown on this line, which we may mark XII; when the Sun has advanced one hour to the west the shadow will be thrown on the next line to the east,

which we may mark I, and so on. The distance of the Sun above the Equator will evidently make no difference in the lateral direction of the shadow. In practice however, we do not want such a cylinder; all that is necessary is a projection called a "style," parallel to the axis of the earth, like the axis of the cylinder, and a dial; the inclination above a level here will be 39° 06′ at the north end of the style.

The principle of both clocks and watches is that a number of wheels, locked together by cogs, are forced to turn around, and are prevented doing so too quickly. The force which gives the motion may be either a weight or spring; the force which arrests the too rapid motion may proceed from a pendulum, which at every swing locks the wheels, or from some equivalent arrangement.

In both clocks and watches we mark the flow of time by seconds, such that sixty make a minute, sixty of which make an hour, twenty-four of which make a day. Those who are not astronomers are quite satisfied with this, and a day is a word with a certain meaning. The astronomer, however, is compelled to qualify it—to put some other word before it—or it means very little to him, because the term day may mean either the return of a particular meridian to the same star or to the Sun again. The term as it is commonly used, means neither the one nor the other, because long ago, when it was found that in consequence of the motion of the earth not being uniform in its orbit round the Sun, the days, as measured by the Sun, were not equal in length, astronomers suggested, with a view of establishing a convenient and uniform measure of time for civil purposes, that a day should be an average for all the days in the year. So our common day is not measured by the *true Sun*, as a sun dial measures it, but by what is called the *mean*, or average, *Sun*.

For a long time after watches and clocks were made with some degree of accuracy, it was attempted to make them keep time with the sun dial, and for this purpose they were regulated at short intervals, and ignorant persons would blame the clock-maker for making an imperfect machine that would not keep time with the sun-dial.

Having said so much of solar days, both apparent and mean, let us next consider the starting points of these reckonings. We have first the apparent solar day reckoned from the instant the true Sun crosses the meridian through about twenty-four hours, till it crosses it again. Second—The mean solar day reckoned by the mean Sun in the same manner. Both these days are used by astronomers. Third—The *civil day* commences at the preceding midnight, is reckoned through twelve mean hours only to noon, then recommences, and is reckoned through another twelve hours to midnight. The civil reckoning is always twelve hours in advance of astronomical. Sidereal time is reckoned from the first point of Aries, and is the only time that can be taken without several corrections. When the mean Sun occupies the *first point* of *Aries*, which it does at the vernal equinox, the time by the mean and sidereal clocks will be the same. This happens at no other time of the year.

A sidereal clock represents the rotation of the earth as referred to the stars,

its hour-hand performing a complete revolution through the twenty four sidereal hours between the departure of any meridian from a star and its next return to it. At the moment a star whose right ascension is oh. om. os , is on the meridian of Kansas City, the sidereal clock ought to show oh. om. os., and at the succeeding return of the star, or the equinox to our meridian, the clock ought to indicate the same time again. I have a sidereal clock at No. 1416 Holmes Street, set and regulated by stellar observation made every clear night, with a forty-eight inch transit of two and three-fourth inch aperture. This instrument is powerful enough to take the passage of a star invisible to the naked eye. Time taken from ten or more stars all agree to the fourth part of a second. This proves the time to be that near correct. This time I reduce to local, or "city" time, using the tables of the American Ephemeris or Nautical Almanac, which gives the sidereal time at mean noon to the hundredth part of a second. A clock set by this time will be kept at the above number, also at No. 16 east 7th Street, and corrections in seconds as near as can be made by a pocket chronometer. This time-taking is mainly for the benefit of the public.

Among the lead ng jewelers of the city there is a difference of five to ten minutes. This renders it impossible to make prompt appointments, or even to regulate a good time-piece.

This irregularity in "city time" should cease. With a view to this end I have spared no pains to find the truth. The meridian adopted is Main Street, at the intersection of 7th, the difference caused by longitude from the eastern to the western limits of the city is ten seconds.

SUN AND PLANETS FOR JULY, 1883.

W. DAWSON, SPICELAND, IND.

The Sun's R. A. for July 1st is 6h. 41m. Increasing about four minutes every day, it is 8h. 42m. July 31st. Its north declination during the month changes from 23° 7′ on the 1st to 18° 15′ on the 31st. It may be remarked that the R. A of Sirius, the brightest of the fixed stars, is 6h. 40m., and its declination 16° 33′ S. So that on July 1st this star souths one minute before noon; and 39° 40′ south of the Sun. A transit instrument of low power is sufficient to observe it. The transit is a valuable and exceedingly interesting piece of apparatus. An amateur of moderate mechanical ingenuity may construct one for himself with a few dollars expense.

The Moon occults Saturn on the 1st, about 5 P. M., and Mercury about twenty-four hours afterward; but both phenomena will be difficult to observe—being in day-time and near the horizon. The Moon will again pass very near Saturn on the 29th, about 4 o'clock in the morning. They will be in the east near three hours high, and may be observed with a small glass. The planets are all morning stars most of the month, except Uranus. It is slowly approaching the star Beta in Virgo, and will come up with it in October.

Venus and Mercury will appear like pretty twin stars near together during the first week of July; Venus being north of Mercury. They will be nearly an hour above sun-rise point in early twilight. Mars is about two hours above Venus and a little more south, but too small and dim to be of much interest. It will be near Saturn—1½° N.—about the 20th.

On July 5th, the Sun passes directly between the earth and Jupiter, making an occultation of the planet which lasts about ten hours. After that Jupiter is a morning star, and may be seen just above the sun-rise point, in the latter part of the month. Saturn is near three hours higher that Jupiter, being a little above, and to the left of Aldebaran, the bright red star in Taurus; and about ten degrees below the Pleiades. It is, therefore, in pretty good position for morning observation. Neptune is still above and farther south—occupying a blank region in Taurus; and can hardly be identified without a good equatorial telescope. In the morning of the 26th Venus and Jupiter will be near together—like a fine double star—Venus to the north. New Moon takes place July 4th, about 9 A. M. An interesting display of sun-spots has been visible in June, and will likely be more or less so in July.

PHYSICS.

ABSOLUTE ATTRACTION OF MATTER.

EDGAR L. LARKIN.

It is known that all worlds within range of the most powerful telescopes are dominated by attraction. They are subject to the law of gravity, and attraction is the grand motor of the machinery of the universe. If we desire to measure a force we must have a unit of measurement, and the object of this note is to find an absolute unit of attraction; to learn how much matter exerts so much attractive energy. The only plan possible, is to find the quantity of matter in the earth, and thus ascertain the strength of attraction exerted by it.

Having found this, it then becomes a simple question to determine the gravity exerted by any sphere whether one inch or 1,000,000 miles in diameter, whether the sun or a croquet-ball. It has been found by repeated experiments, and by different methods, that the density of the whole earth is 5.66, that of water=1. One cubic foot of distilled water at 60° F., weighs 62.321 pounds, which multiplied by 5.66=352.73 pounds. Since the earth's volume is known, its mass becomes a mere question of arithmetic, and is: 6,743,610,190,383,705,901,809 tons.

That is,—if we cut up the earth into balls, bring each, one at a time to the surface, weigh, and replace it whence it came, then if their weight should be 1 ton

each, their number would be as above; while the diameter of each would be 2.21 feet =2 feet 2½ inches.

PROBLEM:—*How much matter must each of two spheres contain, whose centres are one mile—5,280 feet apart, to be able to attract each other with an intensity of 1 avoirdupois pound, both spheres to be isolated in infinite space?*

Given the amount of matter in the earth, also its size, we learn its attractive force. It has been agreed to by some nations to call the attraction exerted by the mass of the earth on 27.727384 cubic inches of distilled water at 60° F.; or upon 3.559356 cubic inches pure iron, 1 pound avoirdupois.

The diameter of a sphere of iron having this bulk is 1.9 inches. We now have given two spheres—one 7916.3185 miles in diameter, and the other 1.9 inches, together with the amount of attraction of each upon the other, which is 1 pound; also the distance between their centres which is 3958.15925 miles, from which data the question must be solved. And we proceed to discuss the case by means of the most elementary forms of analysis to avoid needless difficulties in the way of students. We have adopted the *mean* diameter and radius of the earth.

It is proven in the higher mathematics that the force of gravity exerted by a sphere on a mass at any distance, is the same as would be if the entire mass of the sphere were concentrated at its centre. Now let us place enormous platform scales (Fairbank's?) on the earth's surface, and place the little ball of iron on its platform and observe its weight, which will be seen to be 1 pound. We will see the necessity of using large scales to weigh the small ball as we proceed. Conceive the scales rigidly fixed in space by some power external to the earth, and let the earth become motionless upon its orbit.

Imagine the earth to shrink and subside to a sphere only two miles in diameter, both its centre and also the scales remaining in space in their original positions 3958.15925 miles apart. Then will the ball of iron still weigh 1 pound, because the earth, now two miles in diameter, will have its original mass, though of inconceivable density; and will attract with the same intensity as when expanded.

It is demonstrated by analysis that: Every particle of matter attracts every other with a force *directly* proportional to mass, but *inversely* proportional to the square of distance. That is: The greater the distance between two bodies the less is their mutual attraction. It follows then that the ball on the scales has a weight which we know to be diminished in the ratio of the square of the distance from it to the earth's centre. As our problem relates to a distance of one mile, we assume the earth to have dwindled to a sphere whose radius is one mile, which brings its surface to a distance of a mile from its centre. Thus: 3958.15925 less 1=3957.15925 miles, whose square is 15,659,110. Let us now move the scales to the surface of the sphere and weigh the little sphere of iron. Behold! its weight is 15,659,110 pounds! What scales must we have to determine its weight? Indeed! both ball and scales would be crushed by the appalling force of gravity. We have now arrived at the fact that a sphere having a radius of

one mile, and mass equal to that of the earth exerts sufficient attraction to make one terrestrial pound weigh 15,659,110 pounds. Hence, that the iron should weigh one pound, the large sphere must be diminished in mass so that it will only contain the $\frac{1}{15659110}$ part as much matter, wherefore: 67436101903837059018o9 divided by 15,659,110=430,650,924,991,447 tons =861,301,847,982,894,000 pounds.

Whence it appears that a sphere containing that number of pounds, whose centre is one mile distant from a globe of iron whose diameter is 1.9 inches, exerts gravity imparting to it a weight of one pound; while the small also attracts the large sphere with an intensity of a pound, the sum of the attraction of both globes being two pounds. But the condition of the problem is that both bodies be of equal mass, and still attract each other with the force of a pound.

It is clear that matter must be taken from the large to the small sphere to equalize masses and attraction. Accordingly, let us take one pound from the great and add it to the small sphere. Then the small would attract the large with a force equal to two pounds, and *vice versa;* because by a law of nature we know that action and reaction are equal and opposite. Both globes would develop an energy of four pounds, which is foreign to the problem. Looking into this question closely, we see that if we remove matter from one point to another, its attraction on its original position is lessened in the ratio of the *square* of the *distance.*

Since in this case distance is a constant, gravity is unable to vary from that cause; hence it must vary in the ratio of *square root* of mass. Therefore we must extract the square root of 861,301,847,982,794,000 which is 928,063,494 pounds or 464,032 tons. Two globes in space whose centres are a mile apart, and whose matter if brought to the earth's surface and weighed, would each weigh 464,032 tons, will attract each other with a force of one pound, the energy of both spheres being two pounds: a pine stick one mile long capable of sustaining a weight of two pounds would if placed between them prevent their approach. We may be surprised that such vast masses only a mile distant, should develop such weak force in view of the colossal power demonstrated in relation to solar attraction on the earth, in the June (1883) number of this REVIEW. We therein demonstrated that the Sun exerts upon the earth an attractive energy of over 4,000 quadrillion tons! Surprise, however, will disappear when the immense mass of the Sun is considered.

Of course, the words ton and pound are here used relatively to the earth; for the whole sphere, which on the earth's surface would weigh 464,032 tons, 'weighs' only one pound when isolated in space as in the problem. Here is a table of diameters of globes of several kinds of matter to contain 464,032 tons if weighed on scales on the surface of the earth.

MATERIAL.	DIAMETERS.
Water	298 Feet.
Air	2841 "
The Earth	171 "
Hydrogen	6948 "
Platinum	109 "

From this, it may be seen that two globes of hydrogen of required mass could not have their centres one mile distant, as their surfaces would collide; while the platinum balls would have plenty of room. And such is this mysterious energy—attraction, of whose nature nothing is known. It is inherent in all matter, and since the spectroscope informs us that the stars are made up of materials like those in the Earth and Sun, we say the dominion of gravity is as wide as the universe. Because gravity tends to draw all separated masses to one common centre, the whole sidereal structure would collapse and form one solid mass in its centre gravity, were not attraction balanced by an opposing energy. Such power is the centrifugal tendency evolved by circular motion. Therefore, the sidereal heavens is either tending toward destruction, or is in regular revolution about a centre. The deduction of late astronomy is that it is in rotation; and even now, astronomers are almost ready to locate the centre in infinite space, which from the law of gravity may not contain matter, but is far more likely to be void.

NEW WINDSOR, ILL., June 17, 1883.

STORAGE BATTERIES.

[*Report of Prof. Henry Morton on the Storage Batteries of the Electrical Power Storage Company, Limited, of London.*]

Having made a series of careful tests and measurements of the electrical storage batteries manufactured by the Electrical Power Storage Company, Limited, at their works at Millwall, London, England, I find the following results in reference to their capacity to store and retain energy, afterwards delivered by them as electric current.

In the first place as to the *capacity* of these batteries in thus *storing* electricity, and its relation to the weight and bulk of such battery or reservoir.

The cells with which I have made my experiments are of the pattern called "one horse-power" cells, because they will contain, when fully charged, an amount of energy equal to fully 1,980,000 foot pounds, or one horse-power for one hour.

These cells are externally rectangular wood boxes, twelve and a half inches high, eleven and a half inches wide and five and three-quarter inches thick.

Two of them side by side, as they would stand when in use, occupy about one cubic foot of space.

Each cell contains sixteen plates, whose united weight is forty-eight pounds, and with the lead-lined box and liquid, the entire weight of the cell when in use, is seventy-nine and a half, or say eighty pounds.

One of these cells full charged will yield, as I have found by careful experiment, a current of 32.5 amperes at the beginning, and 31.2 amperes at the close of a continuous discharge for nine hours.

This amounts to 286.5 ampere hours of current, and if even short interruptions or periods of repose occur in use of the current a yet larger total amount can be obtained.

An Edison incandescent lamp of high resistance, giving a light of sixteen candles, requires a current of .73 of an ampere to supply it. Such a current, therefore, as these batteries yield for nine hours at a time, will suffice for forty-four such lamps.

To secure sufficient electro-motive force or propelling power to overcome the resistance of these lamps would, however, require about fifty of such cells, so that a battery of fifty of these cells connected in series, would operate forty-four lamps for nine hours, or for even a longer time in the aggregate, if the use were interrupted, as it would be in practice. If fewer lamps were used with the same battery, they would be operated for a proportionately longer time.

Thus eleven lamps would be supplied by a fifty cell battery for thirty-six hours of continuous action; or as lights are commonly used in private houses, on the average for five hours each night, such a battery once charged, would operate eleven lamps for a week.

To express the relation between weight of battery and power of maintaining a light, we might, therefore, say that for each lamp operated for nine hours, one and a seventh cells of battery would be required, or a weight of about ninety pounds of battery. This would be for each hour of burning each lamp, ten pounds of battery.

This makes a very simple rule for calculating the weight of battery required for any number of lamps for any time. Thus, suppose we wish a battery to operate twenty-five lamps for five hours each night, the battery being recharged during the day. We have 25x5x10=1,250 pounds as the weight of battery required.

Comparing the efficiency of this storage battery with that of other similar arrangements, such as the Faure battery, measured and reported upon by M. Tresca, of the "Conservatoire des Arts et Metiers," it shows a marked superiority. Thus in M. Tresca's experiments a cell weighing ninety-five pounds yielded a current representing 793,791 foot-pounds of energy where your battery yields, as I have stated above, 1,826,168 foot-pounds and only weighs eighty pounds.

Your battery, therefore, yields more than twice the energy and weighs almost one-fifth less.

Even the experiments made some time afterwards by Professors Ayrton and Perry, on other Faure accumulators, though the conditions were rendered as favorable as possible by distributing the discharge over three periods of six hours

each on three successive days, do not show a much better result. In this case the weight of the battery *plates* only is given, and that eighty-one pounds. Reducing the results proportionally for batteries whose plates weigh forty-eight pounds, I find that by the experiments of Professors Ayrton and Perry each cell of this weight should give 853,333 foot-pounds of energy.

This again is less than half the amount of energy which I have repeatedly obtained from your battery.

Passing next to the efficiency of your batteries as regards their delivery of nearly the same current as was used to charge them, I have found that the loss in this relation is less than 10 per cent. In other words, in my experiments I have obtained from these batteries 90 to 91 per cent. of the current used to charge them. This far exceeds the results obtained by M. Tresca with the Faure batteries.

Tresca reports that he recovered only 60 per cent. of the current used to charge the battery, and Ayrton and Perry found the loss in charging and discharging to be "not greater than 18 per cent."

In this, however, is included the loss due to the fall of electro-motive force in the discharge as compared with the charge. This I find to be on the average less than $\frac{2}{10}$ of a volt, which would bring the total loss of available energy obtained from the battery, as compared with that expended in charging it, to 18 per cent.

Lastly comes the very important question as to the retention of charge during a long time. To test this I charged three cells and locked them in a closet on February 1st, where they remained until February 16th, when I began discharging them at the rate of 32 amperes, continuing this rate of discharge on the next day. I thus obtained 266.7 ampere hours of current.

Comparing this with the 286.5 ampere hours of current obtained from the other cells which I discharged soon after charging them, shows a loss of 7 per cent. caused by standing for sixteen days.

The above measurements and comparisons show that this storage battery has attained a degree of efficiency which will render it applicable to a number of uses. Thus, for example, on steam-boats, by the use of such storage batteries, the irregular and occasionally interrupted motion of the main engine might operate a relatively small dynamo-electro machine so as to charge the batteries during the entire twenty-four hours, and the current from these batteries would then supply light with perfect steadiness during the relatively brief time in which it is required. In this way the cost of supplying and running a special and large engine, which would be needed for operating the same lights directly without the storage battery, would be avoided, and also the necessity for extreme steadiness in running the dynamo, and all risks of extinction of the lights, from a momentary interruption of motion in any part of the machinery would be removed, as the battery would secure an absolutely steady and continuous supply of current no matter how little regular might be the action of the engine or dynamo-electric machine.

Again, in larger buildings the engine used to operate the elevator or to do

any other work, if of sufficient power, could charge the storage battery without interrupting its regular work, and thus supply the light needed at a minimum cost for special machinery and skilled supervision.

In private houses where the running of a large engine with extreme smoothness and absolute certainty during the hours when light is needed, would be out of the question, a small engine operated at convenient intervals, and with no need of regularity or of fixed hours, would accomplish all that was required if a storage battery was employed with it.

I am informed that these storage batteries have been successfully applied to the running of street cars, and in view of the fact that they will contain almost 2,000,000 foot-pounds of energy for each eighty pounds of dead weight, I should consider the prospect in this direction most encouraging.

In short it seems to me that there is manifestly a wide field for the profitable employment of this greatly improved form of the electric storage battery.—*Van Nostrand's Magazine.*

METEOROLOGY.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The large rainfall which characterized the second decade of May has been followed by heavy precipitation till the present date—June 20th.

There have been no specially severe storms at this station and the same is generally true through the State, and the damage from wind and floods have been less than usual this year in Kansas.

Winter grains are fast approaching the harvest and are in good order so far. Likewise at present date the corn is coming forward rapidly, with promise of a large crop. These facts are so intimately connected with meteorology that they do not appear out of place in this record.

The prevailing winds have been south, and no very warm weather occurred till the middle of June.

The highest barometric pressure was June 3d, 29.140, reduced 30.096; the lowest barometric pressure was June 11th 28.680, reduced 29.524.

The highest temperature 92°, June 20th; the lowest temperature 38°, May 21st.

Slight frosts occurred May 21st and 22d.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	May 20th to 31st.	June 1st to 10th.	June 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min				
Max				
Min. and Max				
Range				
TRI-DAILY OBSERVATIONS.				
7 a. m.	54.6	62.2	69.6	62.1
2 p. m.	70.7	77.1	83.0	76.9
9 p. m.	60.6	64.3	72.6	65.8
Mean	61.9	67.3	74.1	68.2
RELATIVE HUMIDITY.				
7 a. m.	.907	.948	.909	.92
2 p. m.	.718	.769	.739	.74
9 p. m.	.691	.920	.861	.82
Mean	.771	.880	.833	.83
PRESSURE AS OBSERVED.				
7 a. m.	28.95	28.94	28.92	28.94
2 p. m.	29.05	28.91	28.90	28.95
9 p. m.	28.94	28.93	28.82	28.90
Mean	28.98	28 93	28.91	28.93
MILES PER HOUR OF WIND.				
7 a. m.	16.0	8.5	16.2	13.6
2 p. m.	20.1	15.3	14.0	14.8
9 p. m.	12.4	9.9	13.4	11 9
Total miles	3785	2736	3639	10160
CLOUDING BY TENTHS.				
7 a. m.	3.2	6.2	3.9	4.4
2 p. m.	4.3	4.6	6.0	5.0
9 p. m.	5.5	5.2	4.0	4.9
RAIN.				
Inches	2.70	2.38	2.52	7.60

ANTI-CYCLONIC STORMS.

PLINY EARLE CHASE, LL.D.

The science of meteorology may, for many good reasons, be regarded as a peculiarly American science. William Ferrel's discussion of the motion of fluids and solids relative to the earth's surface, which was first published in the summer of 1856, placed the laws of cyclonism and anticyclonism on a solid mathematical basis. He showed that, in the northern hemisphere, all moving bodies are constantly subjected, in consequence of the earth's rotation, to a deflection towards the right hand. Hence all atmospheric surface currents which are mainly governed by a downward pressure, tend to curve in the direction of the hands of a watch, or successively through north, east, south, west. All surface currents which are mainly governed by an upward pressure, tend to flow in an opposite direction, or through north, west, south, east.[1] The heavy winds are called anticyclonic; the light winds, cyclonic.

1 This will be evident, if we imagine ourselves to be lying in the current and facing the direction toward which the pressure tends.

There can be no descending currents in one place without ascending currents in another; therefore, in every atmospheric disturbance, there must be simultaneous cyclonic and anticyclonic winds. Such disturbances originate either in an unusual cooling and condensation, or in an unusual heating and expansion of air. In the former case the inflow, in the upper regions of the atmosphere, will produce an increased pressure. In the latter, the outflow will produce a diminution of pressure. In the restoration of equilibrium, currents of warm air are often brought into contact with colder currents. If the currents are both saturated with moisture, or if they contain more vapor than can be retained under the temperature of the mixed currents, precipitation takes place, in the form of rain, hail, or snow. This precipitation reduces the weight of the atmospheric column and the barometer falls. Accordingly, there is a constantly increasing tendency to cyclonism about storm centres, and there has been a very prevalent disposition to look upon all storms as of cyclonic origin.

A little reflection, however, will show that the initial mixture of currents may be due to either of the causes above mentioned; either to the flow of warmer air into a cold depression at the top of the atmosphere or to a flow of cold air, at the earth's surface, towards a region of low barometric pressure. In the former case, the initial superficial currents are determined by a downward pressure and they are, therefore, anticyclonic; in the latter they are determined by an upward pressure and are cyclonic.

A careful study of the weather-maps shows that the heaviest rains and snows occur in advance of the centres of low barometric pressure, or in the rear of the centres of high barometric pressure. If storms began in the cyclonic currents, the reverse should be true; the greatest effect following the low centre and preceding the high centre.

The frequent failures of forecasts, during the past winter, seem to have been mainly due to a misinterpretation or a misconception of these facts, to which the writer first called attention in 1871 (Proc. Amer. Phil. Soc. XII, 40). They were subsequently embodied in the "Suggestions" of the Signal Service Bureau, and the officers of the Bureau communicated to the public journals some remarkable evidences of anticyclonism in storms of great magnitude.

Loomis's subsequent discussions of the Signal Service observations have furnished abundant additional evidence of a like character, and have shown the great frequency of anticyclonism at the beginning, and during the continuance of showers and of storms of all kinds.

The limit between anticyclonic and cyclonic tendencies, may be approximately assumed to be midway between the centres of high and low barometric pressure. All cloudiness or precipitation between the limit and the high centre, represents anticyclonic influence; all between the limit and the low centre represents cyclonic influence. Local cyclonism sets in soon after precipitation begins, and the anticyclonic influence is thus partially hidden; but a critical examination of the weather maps will show that the prevailing currents of the region often continue to be anticyclonic until the rain or snow is nearly, or quite over. The

evidences of storm breeding and stormy anticyclonism will be more still striking, it the changes of barometric pressure are studied in connection with the beginnings and subsequent growth of cirrus, cumulus, and nimbus clouds, as well as with the rainfall and the final breaking up of cloudiness.

There are good reasons for believing that such study, systematically and thoroughly continued under the direction, and with the facilities of the Signal Service Bureau, would raise the successful verification of the Washington forecasts to an average of at least ninety-five per cent.—*Journal of the Franklin Institute.*

IMPROVEMENT OF THE NATIVE PASTURE-LANDS OF THE FAR WEST.

N. S. SHALER.

It is a well-known fact, that the greater part of the United States west of the meridian of Omaha is unfit for tillage. Here and there, there are strips of land, which have a larger rainfall, that may be brought under the plough; and along the rivers there are narrow belts of land that may be made tillable by irrigation. A portion of this region is utterly barren; but a large part of it—probably not far from one million square miles of the whole area, or an area nearly one hundred times the surface of Massachusetts—bears a scanty crop of grasses. The natural use of this region is already recognized: its sole worth is for the pasturage of cattle and sheep. Already a great herding industry has been created in this region,—one that has an important bearing on the food-supply of this country and of Europe. The only limitation on the great extension of this industry is found in the scantiness of the herbage and the inadequacy of the water-supply. The latter evil is probably remediable, in most cases at least, by wells or by storage reservoirs, which shall retain the abundant waterfall of the rainy season. I propose to offer some suggestion concerning the possibility of bettering the herbage of forage-plants.

All the grasses that now grow in that region make a scanty herbage. I am informed by stock-raisers that the best "ranges" require from fifteen to twenty acres to a head of horned cattle, and that from this unusual goodness the "ranges" decline in value, until, in many districts, a hundred acres is required to supply a beast. The wide extent of the ranges necessary to afford pasturage to herds of profitable numbers makes the supply of water more difficult than it otherwise would be.

It seems to me possible that the pasturage of this region might be materially improved by the introduction of grasses and other forage-plants indigenous to regions having something like the same conditions of climate. My reasons for hope in this matter are substantially as follows: the experience of settlement in this country shows that the grasses are more easily feralized than any other of our domesticated plants; several of them show a willingness to escape to the wilder-

ness; so that there is hope that a careful selection in various lands might afford some other species that would run wild on our dry plains and mountains. European experiments in naturalizing grasses have been fairly successful, as in the case of grasses to protest dunes from the action of the wind.

There are many regions in the world where grasses have developed to suit just such conditions as we have on our plains; and in some of those regions the period for the process of development to go on has been far longer than in North America. In North America it has been but a single geological period since the vegetation of the plains and Rocky Mountains was well watered; while in Australia it seems likely that the dryness of the climate has been in existence from rather a remote past. The same is probably the case in the northern parts of Asia and in South Africa. Good effects from the introduction of foreign forage plants may be hoped for, if the only result were an increase in the variety of the herbage on the plains. With the poorest grasses there are generally wide interspaces between the tussocks of high-growing species. If these intervals could be filled with other forage-plants, the consequence would be a greater amount of food to the acre.

In the effort to naturalize foreign species of forage-plants, attention should be paid to all forms of plants that can afford pasturage or browsing. There are many forms that would be likely to do well along the streams, that might not succeed so well in the open country.

The regions that are likely to furnish plants calculated to flourish in a region of low rainfall include a large part of the earth's surface. Those that would succeed in Dakota are not likely to do well in Texas or Arizona. For the northern region, the uplands of northern Asia or of Patagonia are the most promising fields of search; while, for the middle and southern fields, the valley of the La Plata, southern Africa, Australia, and the Algerian district, may be looked to for suitable species.

The experiment is naturally one for the federal government to undertake, but it need not be costly. Three experimental stations—one in the northern part of Nebraska, one in Texas, and one in Arizona—would serve the needs of a thorough trial. Ten thousand dollars per annum at each station should meet all the expenses of a sufficient trial; at least, until it was proven that the experiment would be successful. If we add the expenses of a travelling student of wild forage-plants (perhaps another five thousand dollars), we would have a sufficient basis for practical work. If the result should be to increase by only one-tenth the beast-maintaining power of our wild lands, the effort would be worth many millions per annum to the nation. When we consider that the introduction of the species of Poa which receive the name of "blue-grass" has manifolded the pasturage-value of the regions where it flourishes, it is evident that the project is worth consideration.—*Science.*

ARCHÆOLOGY.

STEATITE QUARRIES AND UTENSILS.

G. C. BROADHEAD.

Dr. Charles Rau in Smithsonian Contribution, 1876, says that vessels consisting of hard kinds of stone occur rarely east of the Rocky Mountains. In the Atlantic and Middle States vessels of "potstone" (Steatite) have often been met with. They differ in quality of workmanship as well as shape. He figures a bowl-shaped vessel from Wyoming Territory, and says that by far the best have been found in the Californian Islands, some of them measuring over a foot in diameter, and nicely made and of very regular shape, as one from Los Pueblos, Santa Barbara Co., Cal. Dr. Rau also alludes to the Steatite tubes found in Tennessee, nicely polished and six inches in length.

In Vol. VII Geological Survey W. of 100th Meridian, Prof. F. W. Putnam and Dr. C. C. Abbott communicate much interesting matter concerning the finds in California. Plate VI has fifteen figures of steatite and serpentine vessels from Southern California. The specimens were chiefly obtained by Dr. Paul Schumacher from the islands of Santa Cruz and Santa Catalina. Old Soapstone quarries have been found in Virginia, near Washington, near Providence, Rhode Island, and in New Jersey.

A sketch on page 121 of Schumacher's Report in Vol. VII Geological Survey W. of 100th Meridian, shows the manner of quarrying out the steatite pot forms. It was worked around with a chisel of flint on slate and gradually loosened beneath, then smoothed and hollowed out. Steatite, Serpentine and sandstone have been chiefly used for making these vessels. Pages 117 to 124 inclusive in this volume are devoted to Dr. Paul Schumacher's Report. On the Island of Santa Catalini he discovered an ancient quarry of Steatite and Serpentine, the Steatite is usually of a greenish-gray color, sometimes showing hexagonal prisms in stellated groups, with pearly lustre and greasy touch. In some ledges it is more micaceous. At the quarries Dr. Schumacher found pots and fragments as well as tools and unfinished articles. Several quarries are named including one fifteen feet in diameter and five feet deep. Dr. S. concluded from the numerous outcrops and remains of workings that he had found the main factory of the *Ollas* of the Californian aborigines.

This stone has been in use since the times of Theophrastus and Pliny.

The stone of Siphus and Corno was hollowed in a lathe and formed into culinary vessels, was the variety of talcose rock called Potstone (*Lapis Ollaris*). These quarries were worked in ancient times.

Von Cotta on rocks defines Chlorite-Schist and Potstone as a Schistose aggregate of Chlorite, usually combined with quartz, sometimes also with feldspar, mica and talc, of a greenish color and scaly appearance. Talc-Schist is chiefly Talc with some quartz and feldspar, and of a greasy feel. The so-called French chalk is massive steatite; it is milk-white with a pearly lustre. The U. S. Geological Reports contain nothing bearing upon steatite in New Mexico.

Since the above was in type we have received the following note from Professor Otis T. Mason, of Columbian College, Washington, D. C., upon the same subject.—[ED. REVIEW.

"The substance of which the ancient pot, of which you sent me a fragment, was made, is a coarse variety of steatite or soapstone, a mineral that does not crack in the fire. It is, therefore, the very best substitute for pottery. Indeed, for the aborigines it was much better, since they did not have the appliances for thoroughly baking their clay. The subject of the natural sources of the minerals used in aboriginal arts has been one of absorbing interest to many archæologists, notably, Dr. George Fischer, of Freiburg, in Germany. At one time it was thought that all copper found in graves came from Lake Superior, all soapstone from Pennsylvania, and all mica from somewhere else. The settling of the country and a better acquaintance with geology are constantly bringing to light new sources of supply. I think the occurrence of steatite in the locality mentioned in your note, Central New Mexico, is new."

TERTIO-MILLENNIAL ACQUISITIONS.

Major David J. Miller returned yesterday, June 7th, from a trip down the country to Albuquerque on official business and thence to Socorro in the interest of the Tertio-Millennial Association in quest of objects of value and interest for exhibition at the approaching great exposition in this city. He went at the instance of the committee on antiquities, of which he is secretary. The principal objects obtained and which we believe are to be exhibited under the auspices of the Historical Society of New Mexico, are the following:

A fine oil-painting 6x4 feet, executed, it is supposed, during the time of San Carlos V, of Spain, sent it is said from Madrid to Mexico, and donated from Mexico to some one of the early churches in New Mexico, and now in the possession of Prof. Charles Longuemare, at Socorro.

An ivory statue, in good preservation, representing the Virgin Mary with the infant Jesus, about seventeen inches high. From analogy and calculation, it is thought it was made about the twelfth century from tusks of animals of that period.

An oil painting on elk skin, made in Mexico at least 200 years ago, 6x5 feet in size, representing the apparation of our Lady of Guadalupe, a principal character in the Catholic Church.

A fine oil-painting, the Adoration, 3½x2½ feet, oval, in possession of the churches many years and well preserved.

A fine oil-painting of General Manuel Armijo, the last governor of New Mexico under the Mexican Government, representing him life-size and in full dress as civil and military governor of New Mexico, the only such picture extant, now in possession of Hon. Santiago Baca, at Albuquerque.

Major Miller heard of numerous other objects in other parts of southern New Mexico, worthy of place at the exposition, but could not then go to where they are. We trust his committee will arrange to obtain them. Professor Longuemare will bring with him, besides, an immense amount of ores from the Socorro County mines, his collection of native precious stones in the rough, and many curious articles found among the ruins of the ancient people of New Mexico.

BOTANY.

AN ÆSTHETIC HOUR WITH MY HERBARIUM.

MARY E. HOLMES.

"Ye field-flowers! the gardens eclipse you, 'tis true,
Yet, wildlings of Nature, I dote upon you;
I love you for lulling me back into dreams
Of the blue Highland mountains, and echoing streams.
Not a pastoral song has a pleasanter tune
Than ye speak to my heart, little wildlings of June.
What landscapes I read in the primrose's looks,
And what pictures of pebbled and minnowy brooks
In the vetches that tangled the shore:
Earth's cultureless buds! to my heart you are dear!"

Thus sang the British poet and satirist, Thomas Campbell, 'ere the objects of his youthful enthusiasm had faded away, and his harp had been unstrung by domestic affliction. These wildwood tokens in my herbarium, these tassels in their tawny bloom, refresh one with the song of April brooks, and I greet them with a gladder welcome than when from the woodland shadows, the wild gardens of the prairie, or from the sheltering rock I plucked them.

This little plant, with its finely cut leaves, pearly white petals, and purplish brown anthers, reminds me of many a childhood's ramble on the Western Reserve. It is the *Erigenia bulbosa*—Daughter of Spring—is its fanciful name, and from this folio sheet, it suggests the carol of the robin and the song of the blue-bird as distinctly as they trilled a dozen years ago. Here is the downy Wind-Flower *Anemone patens, var. Pulsatilliana,* "little gosling" the prairie children call it,—a sturdy youth,

"For cold blew the bitter, biting north
Upon its early, humble birth,
Yet cheerfully it glinted forth
Amid the storm."

and clad in its silvery, silken hair it lifts its unassuming head in humble guise, long before its many cleft leaves arise from their frosty beds. On this sheet is the Trailing Arbutus, *Epigea repens*,—a pleasing reminder of an incident in the early history of our nation. When the dreary winter of 1620 was passing away, above the brown leaves so dry and dead, this little herald of spring was the first to greet the Pilgrims with its rosy hue and sweet perfume. "God be praised," said the fathers, "this is the promise of a future harvest; behold our May flower here," and this pretty plant thus christened "the May flower" upon the bleak shores of New England, has ever been sacred to love and hope.

There is a cluster of Bluets, *Houstonia cerulea*, with their pale blue faces and bright yellow eyes,—some of them, hoary from very age, donning the pure white,—all gathered from yonder meadow, where they form a rich tapestry fit for the gods to walk upon. These are gaudy Painted Cups, *Castilleja coccinea*, the admiration not alone of those untaught botanists, the Aborigines, who, in their wierd fancy believe the great Manitou has scattered these ragged, painted tufts as symbols of the warriors' feathers to be worn in the blissful hunting grounds, but of the amateur botanist who finds herself puzzled by the brilliant crests of the floral bracts, and watches and wonders till her own iris wears their blazing hue. The next is the American Senna, *Cassia Marilandica*, with its six to nine pair of oblong lanceolate leaflets, the wedge-shaped gland at the base of the petiole, and its bright, yellow flowers. The leaves of this plant with those of its cousins german, the *C. acutifolia* and *C. elongata*, natives of Africa, are the senna of commerce, so largely used by pharmacists. Closely allied to the Cassia is this Sensitive Plant, *Mimosa pudica*, with its pinkish flowers in globular heads, and digitate, primate leaflets, a native of Brazil, but often adorning our conservatories. Notice the knots at the several joints of the leaves; these are a sort of Leyden jar, an undefined electrometer, so sensitive to external pressure, the trembling of the ground, or surface irritation, that a single leaflet, a pair or more, as well as the entire leaf, will quickly announce any disturbance.

It is sometimes pleasant for us, when our faith is low, and we are conscious of our own ignorance and weakness, to have a lesson palpable, occult for daily study, to be strengthened by Nature as well as revelation, and perhaps no plant in all my herbarium has been to me such a simple object lesson as this one. For years it has been such a reminder that with a feeling quite akin to friendship, not to say reverence, it has been cultivated at my window, where I could not fail to have the lesson presented to my eyes. It is only the *Echinocystis lobata*, the wild Balsam Apple, *alias* Wild Cucumber, but from day to day it sends out its delicate tendrils, as if conscious not only of its need of support, but *certain* of finding it. It finds it, then strengthening and tightening its hold, it lifts itself up an inch,

more or less, and the whole plant is stronger. It can now withstand a storm which before would have prostrated, or at least rudely marred it, and thus from day to day it lives a life of faith,—more, its beautiful and numerous monœcious racemes of greenish white flowers are the blessings beautifying the whole. The lesson to me is an impressive one, and ever new and helpful; the tendrils of faith are unnoticed by the world's casual observers, but the delicate flowers—the blessings—meet a ready appreciation.

This Gentian, *Gentian crinita*, with its solitary four-cleft corolla, gathering as it were into its fringe-edged chalice, the reflection of the pure autumnal sky, and bluer still by its draughts of nightly frost, has a language quite different from the Echinocystis—"Hope blossoming within the heart"—a continuance, and Gentius, the ancient Illyrian King could not have chosen a better genus to perpetuate his name. It is one of the few medicinal herbs which in the science of medicine, proves the survival of the fittest, for its history can be traced direct for 2000 years, and it is as useful and beautiful to-day as then, whether crowned with its yellow flowers on the plains of Illyria or the cerulean blue of our own country. I turn to the *Chrysanthemum roseum*, and over it broods the legend of the Moorish lady with jeweled hand and glittering necklace, clad in colors rare, threads of rose inwrought with gold. Under the dulcet tones of the guitar she sleeps and dreams of her lover, "who cometh not again," for she sees him die, and with a shriek she awakens to find the pledge of love sent home, two ringlets in a love-knot. As she swoons and dies, the red chrysanthemums upon her brow grow white as snow, and thus it is that the white chrysanthemum, whose odor, like that of many other flowers, is sweetest when crushed, is now an emblem of love that never dies. Nature holds out many a jewel for our adornment, her silent pictures fall into the tapestry of our life's work, and the language of flowers often comes to us pregnant with inspiration. So when with faint heart and sluggish indifference, I dreamily wish for some inheritance, the Mistletoe, *Phoradendron florescens*, meets me, unwrecked by fierce winds or scorching heats, maintaining its place, whether upon the topmost bough, pendant from some under-surface, or growing horizontally from the side of the tree, with its resolute cry "I surmount all difficulties."

"Thou must be true thyself,
If thou the truth would teach;—
Thy soul must overflow, if thou
Another's soul would reach.

"Speak truly, and thy word
Shall be a fruitful seed;
Live truly, and thy life shall be
A great and noble deed."

ROCKFORD SEMINARY, ILL., April 17, 1883.

BOOK NOTICES.

THE GOLDEN CHERSONESE: By Isabella L. Bird. Octavo, pp. 483, with illustrations and map. G. P. Putnam's Sons, New York, 1883. For sale by M. H. Dickinson.

Mrs. Bishop certainly excels most travelers in selecting interesting travel-grounds and presenting their salient features attractively. She also has a faculty of picking up new items even in old fields and serving them up tastefully. Her previous books, such as "Unbeaten Tracks in Japan," "A Lady's Life in the Rocky Mountains," "The Hawaian Archipelago," etc., are well known evidences of these qualifications, and this latest volume is no exception.

The Golden Chersonese, known to the earlier geographers as *Cherronesus Aurea*, and to later ones as the Malay Peninsula, has been sung by Milton and other poets, described by Ptolemy, and its identity with the Ophir of Solomon discussed by many writers, but its actual metes and bounds are clearly understood by but comparatively few. The derivation of the word Chersonesus sufficiently indicates that it is a peninsula, and yet it is more generally than otherwise understood to be an archipelago, while the average reader rarely identifies it as Malacca.

It is nearly or quite as large as Lower California, but has twelve times as many inhabitants, or, about 375,000. It is rich in minerals, iron-ore of 60 per cent purity being used for macadamizing the roads, tin having been found in vast quantities in placers, and gold so abundantly, especially in the past, as to have given rise to the theory above alluded to that the country is the original "Ophir." The natives are so jealous of foreigners that but little is known of its internal government, geography, history, or natural products, and not more than half of its immense area has been explored. Consequently these letters of Mrs. Bishop's carry with them more than the ordinary piquancy and interest of travelers' stories in general.

It is difficult to point out the best chapters where all are good, sprightly and attractive. The reader will not regret giving a few hours to a perusal of the whole book.

FRENCH FOREST ORDINANCE OF 1669: Compiled and translated by John Croumbie Brown, LL.D., Edinburgh. Oliver & Boyd, 1883.

This celebrated ordinance, promulgated by Louis XIV, of France and Navarre, in 1669, though probably the basis and foundation of all forest-preserving laws that have followed since, has never before appeared in English dress. Professor Brown, in giving it and an account of the previous treatment of forests in France, has rendered a special service to the bibliography of forestry which all per-

sons and countries interested should not be slow to acknowledge. He is devoted to this subject and as an evidence of his unselfishness in the cause, proposes to employ without deduction all the proceeds of sales of this volume and that upon "The Forests of England," which we noticed in the April number of the REVIEW, in the publication of some similar work, several of which he has in contemplation. The perusal of this ordinance will prove to most readers a very curious and interesting occupation, and one which will amply repay them for the time bestowed upon it.

TOPICS OF THE TIME, Vol. I, No. I: Edited by Titus Munson Coan. 12mo. G. P. Putnam's Sons, New York, 1883. For sale by M. H. Dickinson; Cloth 60c, Paper 25c.

The above named enterprising publishers have commenced a series of essays by the best writers of the day, to be issued monthly under the general title of of *Topics of the Time*. The first number is devoted to "Social Problems," comprising World-Crowding, by Robert Griffin; Europe in Straits, from *Blackwood's Magazine;* Secret Societies in France, by Jehan de Paris; Home Rule and Secession, by J. Woulfe Flanagan; A Democrat on the Coming Democracy, by Henry Laboucherie; The European Terror, by Emile de Laveleye; The Nationalization of the Land, from the *Edinburgh Review;* A Politician in Trouble about his Soul, by Auberon Herbert.

The grouping of topics by volumes is the distinguishing feature of the present series, thus giving the reader a comprehensive view of the discussions of which they form a part. The next volume will be entitled Studies in Biography, comprising a sketch of the lives of Gambetta, Swift, Miss Burney, Wilberforce and other prominent figures in history.

THIRD BIENNIAL REPORT OF THE KANSAS STATE BOARD OF AGRICULTURE. Wm. Sims, Secretary. Octavo, pp. 710. Kansas Publishing House, Topeka, 1883.

This is the third of these handsome volumes which, in our judgment, have done so much more to promote the growth and development of the resources of Kansas than anything else. It includes the years 1881 and 1882, and embraces the reports of appointed officers, together with statistical exhibits, colored outline map of the State, sectional map of each county showing their relative size and location, railroads, water-powers, coal mines, etc.

The Geological Report is made by Professor O. St. John and comprises some thirty pages. Professor J. H. Carruth, of the Kansas University, makes a report of "Additions to the Catalogue of Kansas Plants." Professor John W. Robson one upon "Practical Botany—Its Relations to Agriculture." Professor E. A. Popenoe one upon "Entomology." Professor Hawn furnishes a very complete Meteorological Record for 1881 and 1882. Professor G. H. Failyer, of

the Kansas Agricultural College, contributes an article upon "Scientific Agriculture." Professor G. W. Hoss describes in full the School System of Kansas, and D. B. Long, the State Fish Commissioner, makes a report upon "Fish Culture."

This valuable and comprehensive volume concludes with a chapter upon the public lands, Government, State, and railroad, now offered for sale, with amounts, prices, land offices, etc. No better means of developing the resources of the State than this can be devised, and it would be well for Missouri if some similar plan should be adopted.

AUTHORS AND PUBLISHERS: Octavo, pp. 96. G. P. Putnam's Sons, New York, 1883. For sale by M. H. Dickinson.

This is sent out as a manual of suggestions for beginners in literature, and comprises a description of publishing methods and arrangements, directions for the preparation of manuscripts for the press, explanations of the details of book-manufacturing, instructions for and examples of proof-reading, samples of printing in various sized type, the United States Copyright Law, and information concerning international copyright, general hints for authors, etc.

No book of the kind that we have ever seen covers the whole ground so well and it will be found useful to all classes of writers and interesting to most readers.

THE AMERICAN CITIZENS' MANUAL, Part II; By Worthington C. Ford. 8vo. pp. 184. G. P. Putnam's Sons, New York, 1883.

In Part I of this work the author considers the functions of the government, with special reference to National, State, and local Governments, the electorate, the civil service, etc. In Part II he discusses the questions of personal rights, protection to property; the function of the Federal Government, its war-power, foreign relations, regulation of commerce, naturalization laws, post-offices, post-roads, Indian policy, disposition of public lands, etc. Also the functions of State governments as regards corporations, education, charitable institutions, State finances, etc.

It is an exceedingly valuable work for citizens of all classes, whether native-born or naturalized, and would make an excellent class-book for older students in our schools and colleges.

EDITORIAL NOTES.

THE Kansas City Academy of Science has recently purchased the valuable and extensive collection of fossils, minerals, archæological relics, shells, birds and insects, made by Judge E. P. West during a number of years past. The Academy has also taken larger rooms, purchased some new cases for its enlarged collection and will soon have its library and museum in order for the use and benefit of its members and the public.

WE were visited on the 20th of June by Dr. Steven bowers, of Falls City, Nebraska. The Doctor was for several years engaged in archæological explorations on the Pacific Coast, part of the time under the direction of the Smithsonian Institution, and has written some valuable papers for the REVIEW and other scientific magazines, besides sending a large number of highly prized specimens to the National Museum. He will soon return to California, from where he promises to send an occasional article for the benefit of our readers.

THE article upon "Steatite Quarries and Utensils," by Professor Broadhead, and the note by Professor Otis T. Mason on the same subject, were written in reply to an inquiry by us, whether the finding of a steatite pot in Central New Mexico, lately, was in any respect peculiar, the writer having never before heard of any similar find, either of the manufactured article or of the substance itself in position in that region.

THE Tertio-Millennial Celebration of the settlement of Santa Fé, which commences this week, will be a highly interesting affair, and those persons who have never visited that portion of our country should take advantage of this opportunity to observe the manners and customs of a people and a civilization that are fast passing away and being merged in those of to-day. Railroads and Yankees are the antipodes of archæology and the antique, and it will be but a little while before all traces of the Aztec life will utterly disappear from New Mexico.

THE article on the History of Railroads in Missouri, in the present number, was written by Hon. Geo. C. Pratt, member of the State Board of Railroad Commissioners, and is the most complete and readable condensation of the subject that has yet been published.

PROFESSOR S. H. TROWBRIDGE, of Glasgow, Mo., who has spent many years teaching Natural History, is now devoting himself to supplying schools, colleges, or individuals with suitable collections of illustrative specimens. We know of no man in the west more able or better prepared to do this satisfactorily.

PROFESSOR R. T. BOND, of Glasgow, Mo., in remitting for the REVIEW says, "I prize it very highly and wish you much success in its publication."

ITEMS FROM PERIODICALS.

THE *Atlantic Monthly* for July, 1883, presents the following attractive table of contents: A Roman Singer, I, II, F. Marion Crawford. Some Phases of Idealism in New England, O. B. Frothingham. A Prelude, Maurice Thompson. En Province, I, Henry James. Something Passes, Edith M. Thomas. Tompkins, P. Deming. Service, E. R. Sill. Oxford in Winter, Harriet Waters Preston. Newport, I, II, George Parsons Lathrop. Boomtown, Frank D. Y. Carpenter. Municipal Extravagance, Arthur Blake Ellis. Mr. Washington Adams in England, II, Richard Grant White. Sylvan Station, Caroline E. Leighton. American Fiction by Women. Jones Very. American Economics. The Freedom of Faith. Dobson's Fielding. The Contributors' Club. Books of the Month.

THE *Journal of Education*, which keeps fully up to the times in all educational matters, east or west, says that the Supreme Court of Missouri has decided that the expenditure by the St. Louis Board of its revenues, for the purpose of admitting and instructing in their schools children under the age of six years, is a use of its funds not authorized by the State constitution, but forbidden. This practically forbids public kindergartens in the City of St. Louis. The same court has decided that the teaching of the arts, sciences, and languages, other than English, is authorized by law.

THE *Magazine of American History* for June, has been received. It is now edited by Mrs. Martha L. Lamb, and published by the Historical Publication Society, 30 LaFayette Place, New York, monthly $5.00 per annum.

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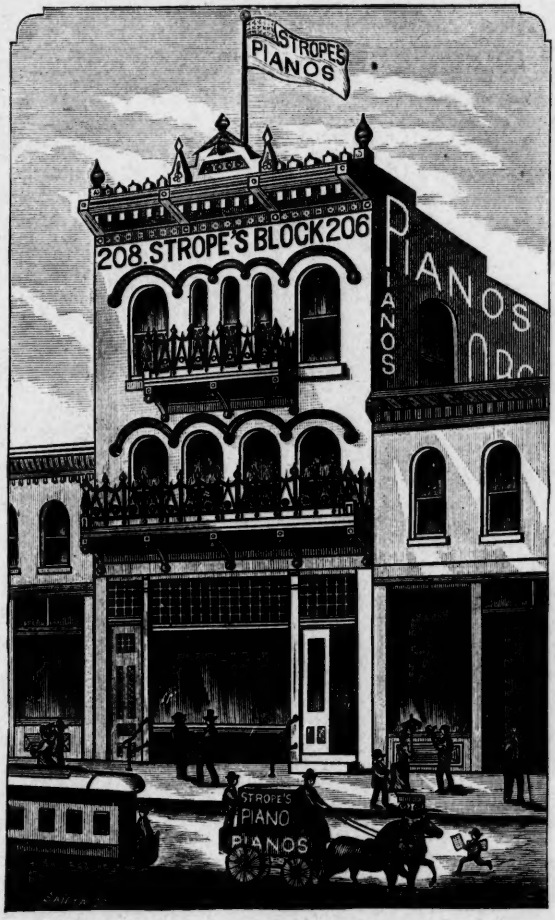

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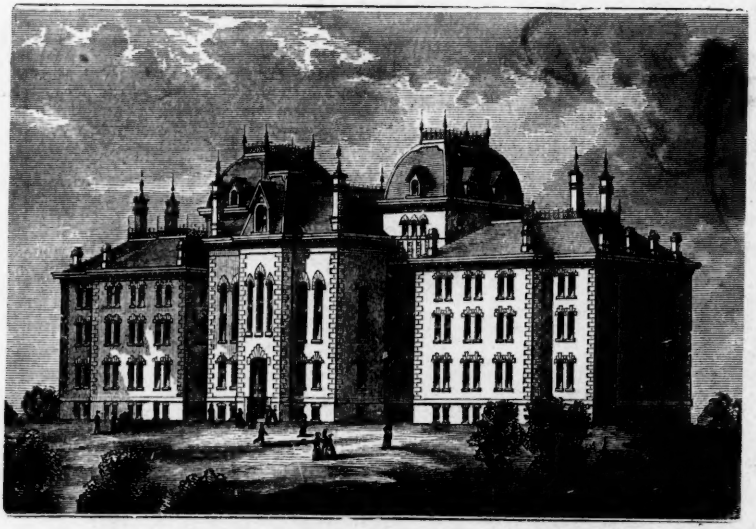

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